NAVAER 50-30GMT1-501

HANDBOOK

SERVICE INSTRUCTIONS

AUTOMATIC WEATHER TRANSMITTING SET

AN/GMT-1(XG-1)

Published under the authority of the Secretary of the Navy
and the Bureau of Aeronautics

U. S. NAVAL AVIONICS FACILITY
Indianapolis 18, Indiana

STAT

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When replacing an impeller on an anemometer use only one marked with a number followed by letter "A" or "B". This number is located on the inside of the impeller hub. For "B" impellers use correction factor shown at the bottom of the WIND SPEED versus CODE LETTER data sheet.

CAUTION: Do not use impellers not marked as above.

H A N D B O O K

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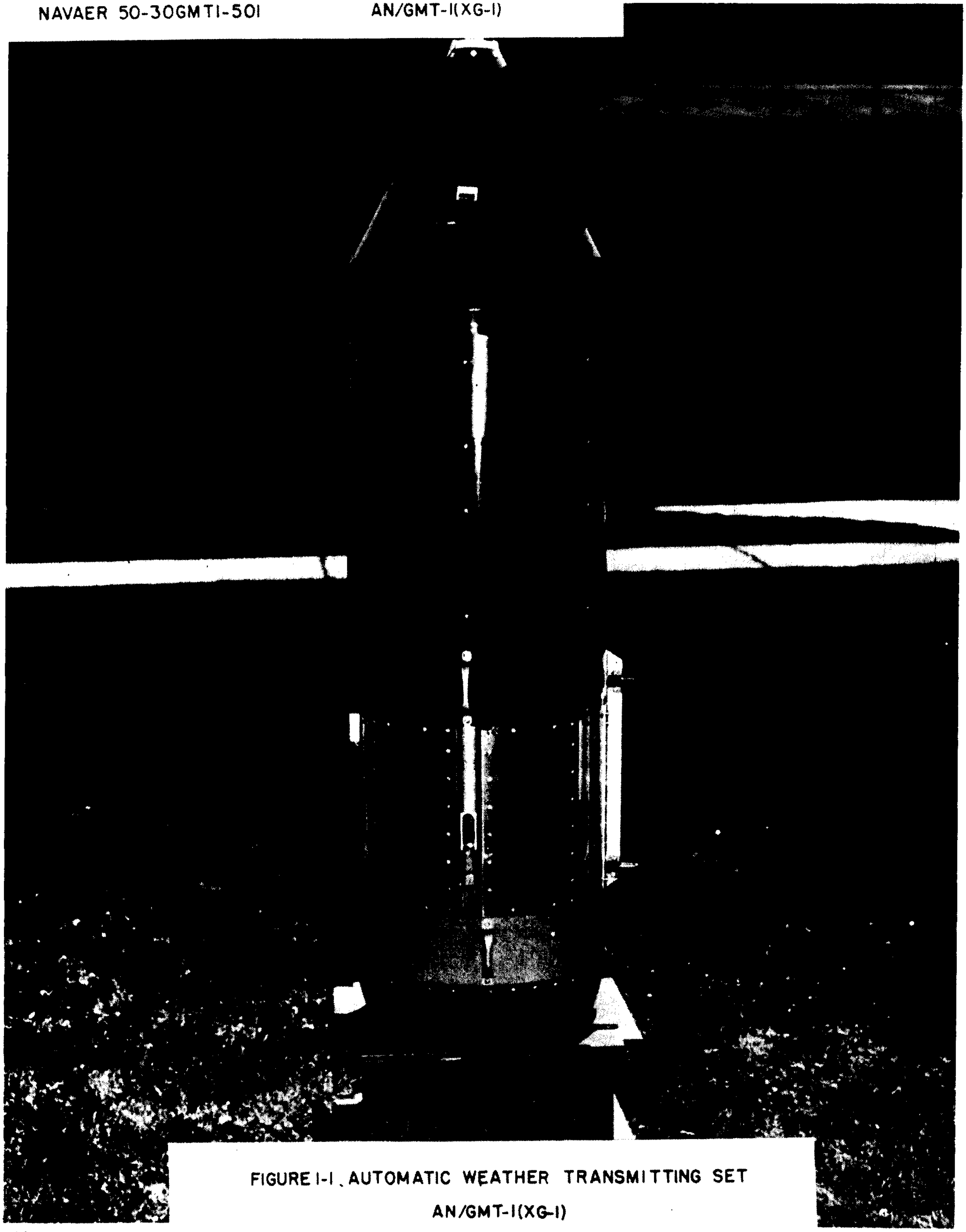


FIGURE 1-1. AUTOMATIC WEATHER TRANSMITTING SET AN/GMT-1(XG-1)

SECTION I

GENERAL DESCRIPTION

1-1 PURPOSE OF HANDBOOK

1-2 This handbook contains both operation and maintenance instructions for Automatic Weather Transmitting Set AN/GMT-1(XG-1) manufactured by the U.S. Naval Avionics Facility, Indianapolis, Indiana.

CAUTION

DO NOT ATTEMPT TO OPERATE THIS EQUIPMENT WITHOUT FIRST BECOMING FAMILIAR WITH ALL INSTRUCTIONS IN ALL SECTIONS OF THIS HANDBOOK.

1-3 PURPOSE OF EQUIPMENT

1-4 The Automatic Weather Transmitting Set AN/GMT-1(XG-1) shown in Figure 1-1 is designed to be dropped by parachute into its operational area. After being dropped, the equipment will automatically erect itself into operating position and thence transmit weather data by radio on a preset schedule. The equipment is designed to fulfill the operational need for weather data from polar and other areas accessible only by air. It will provide data on - temperature, atmospheric pressure, wind velocity, wind direction, and identifying call letters. The equipment was manufactured and calibrated to operate to a minimum temperature of -65°F. It will operate at lower temperatures than this but with increased errors and a shorter operating life.

1-5 GENERAL PRINCIPLES OF OPERATION

1-6 The Automatic Weather Station (Figure 1-1) consists of bomb-shaped aluminum alloy structure containing a parachute self-release mechanism, telescopic antenna, crystal controlled transmitter, storage battery power, meteorological instruments, coding mechanism, and associated components. The transmitter operates on a frequency of 4223 K.C. type A1 emission with a power output of approximately 15 watts. Under favorable conditions transmission of this unit has been monitored in excess of 1000 miles.

1-7 The Weather Station is designed to be carried by aircraft on standard internal or external bomb racks, or it may be successfully ejected manually through access doors of any suitable aircraft. For cold weather operation in polar areas, it is recommended that the equipment be ejected by the latter means in order to protect the operating mechanism from the low ambient temperature. Should it be necessary to transport the equipment on an external bomb rack, the aircraft speed should be restricted to not more than 350 knots and it should not be dropped at speeds above 225 knots. The equipment is lowered to the ground by a 35' extended skirt type parachute. The parachute is automatically opened by means of a static line attached to the aircraft. The parachute is detached from the Weather Station on ground contact by means of an automatic parachute ground release mechanism.

1-8 Erection of the Weather Station is accomplished after a preset time interval, which is actuated by the parachute drop, by means of a pneumatic system whereby an inert gas (preferably helium) operates six erecting legs. Following the erection of the station, the telescopic antenna is extended by the remaining gas. Due to the low center of gravity and the geometry of the erecting legs, erection of the equipment is possible on a surface sloping as much as 45°. For efficient operation, however, it is recommended that the equipment be dropped on as level a location as possible.

1-9 Meteorological conditions and a call letter to identify the station are transmitted.

1-10 EQUIPMENT SUPPLIED

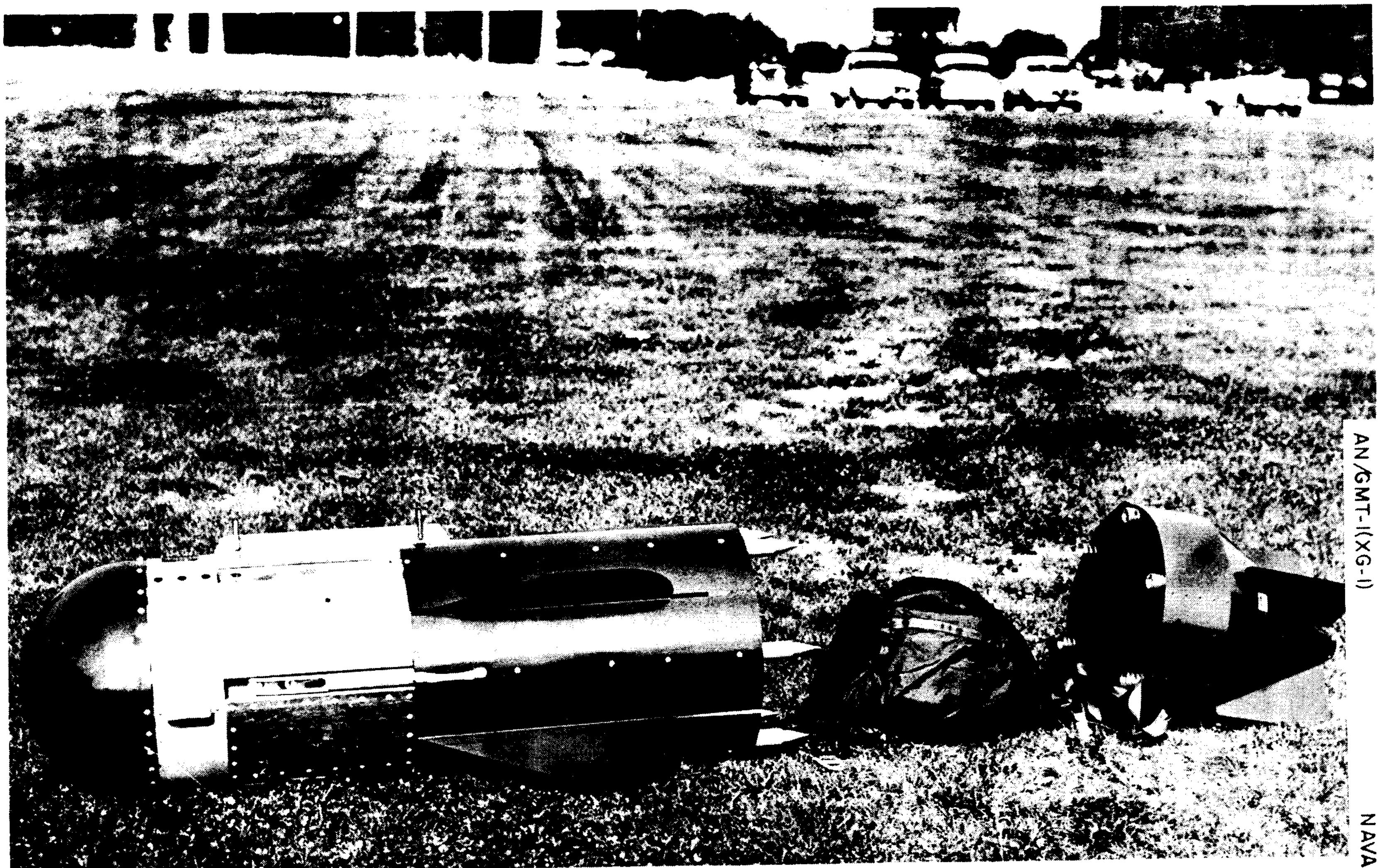
1-11 Equipment supplied as part of Automatic Weather Transmitting Set AN/GMT-1(XG-1) is listed in Table 1-1, and includes quantity per equipment official nomenclature, over-all dimensions, and weight.

TABLE 1-1

QUANTITY PER EQUIPMENT	OFFICIAL NOMENCLATURE		OVERALL DIMENSIONS (INCHES)			WEIGHT (LB)
	NAME	TYPE	LENGTH	WIDTH	HEIGHTH	
1 ea	Automatic Weather Transmitting Set	AN/GMT-1 (XG-1)	77	21	21	220
1 ea	Test Set		11	9 1/2	3 3/4	10

1-12 EQUIPMENT REQUIRED BUT NOT SUPPLIED

a. BATTERY CHARGER Each equipment is shipped with a storage battery installed. This battery is in a discharged state and requires complete charging prior to testing or using the unit. The battery is a sintered-plate nickel-cadmium type as manufactured by the Sonotone Corporation, Elmsford, New York. Before attemtping to charge the battery read the Service Manual provided. See Section II paragraph 2-7.



MAIN UNIT PARACHUTE TAIL CONE

FIGURE 1-2. AUTOMATIC WEATHER TRANSMITTING SET AN/GMT-1(XG-1). MAJOR COMPONENTS

b. HELIUM Before the pneumatic system of this equipment can be actuated, it must be charged using Grade A, B, C, or D Helium. See Section II, paragraph 2-10.

1-13 DESCRIPTION OF MAJOR COMPONENTS (See Figure 1-2)

a. MAIN UNIT This is the principle structure of Automatic Weather Transmitting Set AN/GMT-1(XG-1) which houses the erection devices, weather transducers, and associated electrical and mechanical apparatus required for its operation. It is designed for maximum strength and minimum weight using standard aircraft type construction.

Three decks divide the interior into two main compartments and a nose section. Six side panels completely enclose the compartments and also provide strength to carry some of the impace and erection loads. Panels or chaps attached to each of the six legs serve the two-fold purpose of covering the louvers while in flight and increasing the leg supporting area for erection in snow. Removable handhole covers provide easy access to both the lower and upper compartments for tests or adjustments. A false deck is placed over the top main deck to prevent the heating effect of the sun from affecting measurements. Four fins, necessary to stabilize the weather station as it is dropped are held in place by the leg panels.

Hangers are provided so that the weather station can be carried with a standard bomb shackle.

The hemi-spherical nose section below the lower deck contains the battery in its holder. The area between the battery and the inside surface of the nose section is filled with an insert made of a foamed plastic. The deformation of the nose section and the plastic serves as an energy absorber on ground impact.

The upper compartment contains the meteorological transducer excluding the wind vane and anemometer which protrude from the upper deck. The electronic equipment is housed in the lower compartment.

While being lowered by parachute, the weather station is supported by a center support post running down to the second deck. The top section of this post is ejected during erection, leaving the top deck unobstructed.

b. TAIL CONE The tail cone houses the parachute and the special deployment bag. The peak of the conical deployment bag is connected to the tail section by means of a bridle arrangement of three lengths of 1-inch nylon webbing. Instructions for packing the parachute are contained in Section V , paragraph 5-11. Four fins on the tail section aid in stabilizing the weather station when it first leaves the aircraft.

Six coil springs are mounted in spring wells around the front edge of the tail section on the inside of the skin. When the tail cone is installed on the main unit of the weather station, these springs are compressed and the tail cone is secured in place with two tie-down cables. These cables are fastened under tie-down clips on the main unit and are joined at the tail by a release linkage held together by a small release fitting. This fitting is attached to the static line which is in turn fastened to the aircraft.

When the weather station is released from the aircraft, the static line (which is of sufficient length to allow the station to fall clear of the aircraft) pulls the release fitting, thus freeing the tie-down cable. The tail section, being spring-loaded to the main body, is immediately ejected and serves as a pilot chute for deployment of the main canopy. The tail section falls free when deployment is completed.

c. PARACHUTE A 35 foot, extended, skirt-type parachute with a 3-foot extension is packed in a special conically shaped deployment bag. The parachute is designed to allow dropping speeds up to 225 knots. The parachute is packed in the deployment bag and installed in the tail section with a light breakable cord lacing across the open end to prevent premature movement. The suspension lines of the parachute are fitted to an ordinary D-ring which is connected to a modified automatic parachute ground-release assembly.

1-14 ELECTRICAL CHARACTERISTICS (See Table 1-2)

TABLE 1-2

ELECTRICAL CHARACTERISTICS

Frequency	4223 K.C.
Type of Emission	A1
Power Output	15 watts
Power Requirements	Self-Contained 60 Amp-Hr 13.5 volts Storage Battery

1-15 QUANTITY AND TYPES OF ELECTRON TUBES (See Table 1-3)

TABLE 1-3

ELECTRON TUBES

UNIT	NUMBER OF TUBES INDICATED				
	2E26	6005	6265	6C4	TOTAL
Bridge Amplifier		1	1		2
Transmitter	1			1	2
TOTAL EACH TYPE	1	1	1	1	4

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SECTION II

INSTALLATION AND ADJUSTMENT

2-1 UNPACKING AND INSPECTING THE EQUIPMENT

2-2 GENERAL Automatic Weather Transmitting Set AN/GMT-1(XG-1) is a precision unit and requires careful handling to prevent damage, both during use and while in transit or storage. It should remain packaged at all times when not in use.

2-3 This equipment is packaged for shipment using Method 11 procedures prescribed in Specifications MIL-P-116A for protection against fungus, vapor, and moisture.

2-4 UNPACKING Select a location where the equipment can be unpacked without exposure to the elements. Proceed as follows:

CAUTION

During all unpacking procedures, exercise extreme caution to prevent damage to the equipment.

a. Cut and fold back metal strapes or wires.
b. Remove any nails with a nail puller and remove top and sides of box.

CAUTION

Do not attempt to pry off sides and top, equipment may be damaged.

c. Remove moisture-vapor barrier and the corrugated or metal container.
d. Remove any bolts securing the equipment to the packing case or mounting surfaces built inside the packing case.

2-5 INSPECTION Inspect the equipment for possible damage incurred during shipment. Check contents of the packing case against the master packing slip for completeness.

2-6 Automatic Weather Transmitting Set AN/GMT-1(XG-1) is shipped as a complete unit and requires no installation. Only three things must be done prior to use:

1. Battery charge
2. Pneumatic system charge
3. Transmitter tuning

2-7 BATTERY CHARGE The battery was shipped in a discharged state but is complete with electrolyte. It must be fully charged before it can be used. The battery used is a sintered-plate nickel-cadmium type manufactured by the Sonotone Corporation, Elmsford, New York. A service manual for the battery is furnished with the equipment. It is rated at 60 ampere-hour and when fully charged will read 13½ volts.

2-8 Before the battery can be charged it must be removed from the equipment so it will be free to vent gas released during charging. To remove it first unscrew all screws holding on the hemi-spherical nose section and take off nose section. Disconnect battery cable at battery AN connector. Remove screws holding box in place. Set battery on bench for charging. Connect the positive terminal of the charging source to the +12 volt lead of the battery, and the negative terminal to the negative (black) battery terminal (No connection is required to the 6 volt lead).

2-9 Charge the battery in an upright position. If a constant current type of charging is used, the ampere-hour charge input should exceed the rated 60 ampere-hour capacity by 40%. It should thus be charged until 84 ampere-hours have been put in; a charge rate of 24 amperes for 3½ hours for example. If a constant voltage method of charging is used, the cell voltage is limited to 1.55 volts. If the battery is fully discharged, the initial charge current will be very high (Use limiting resistor if necessary to avoid exceeding charger capacity) but will fall off rapidly as the end of the charge is reached. The time required for charging will depend on the capacity of the charging equipment.

2-10 PNEUMATIC SYSTEM CHARGE The reservoir tank must be charged to a pressure of at least 950 psi prior to using the equipment. Use Grade A, B, C, or D Helium.

2-11 Remove the handhole cover "PRESSURE TANK" (See Figure 2-1). Visually examine the gauge and filler valve assembly to be certain nothing has been damaged in shipment.

2-12 A regulator assembly must be used during the charging operation, preferably a Victor Equipment Company type GS-30 GAS-O-DOME Regulator. Connect the regulator to the filler valve through a section of pneumatic tubing. Then proceed as follows:

1. Close filler valve tight.
2. Bleed valve should be open about one-half turn.
3. Crack valve on helium tank to allow inlet pressure to equalize.
4. Close bleed valve.
5. Open load valve slowly and leave open until the desired outlet pressure is established.
6. Close load valve.
7. Open filler valve on the weather station and watch gauge. When a pressure of 950 p.s.i. is reached, shut off filler valve.
8. Then close valve on helium supply tank.
9. Open bleed valve and load valve.
10. Disconnect equipment and replace handhole cover.

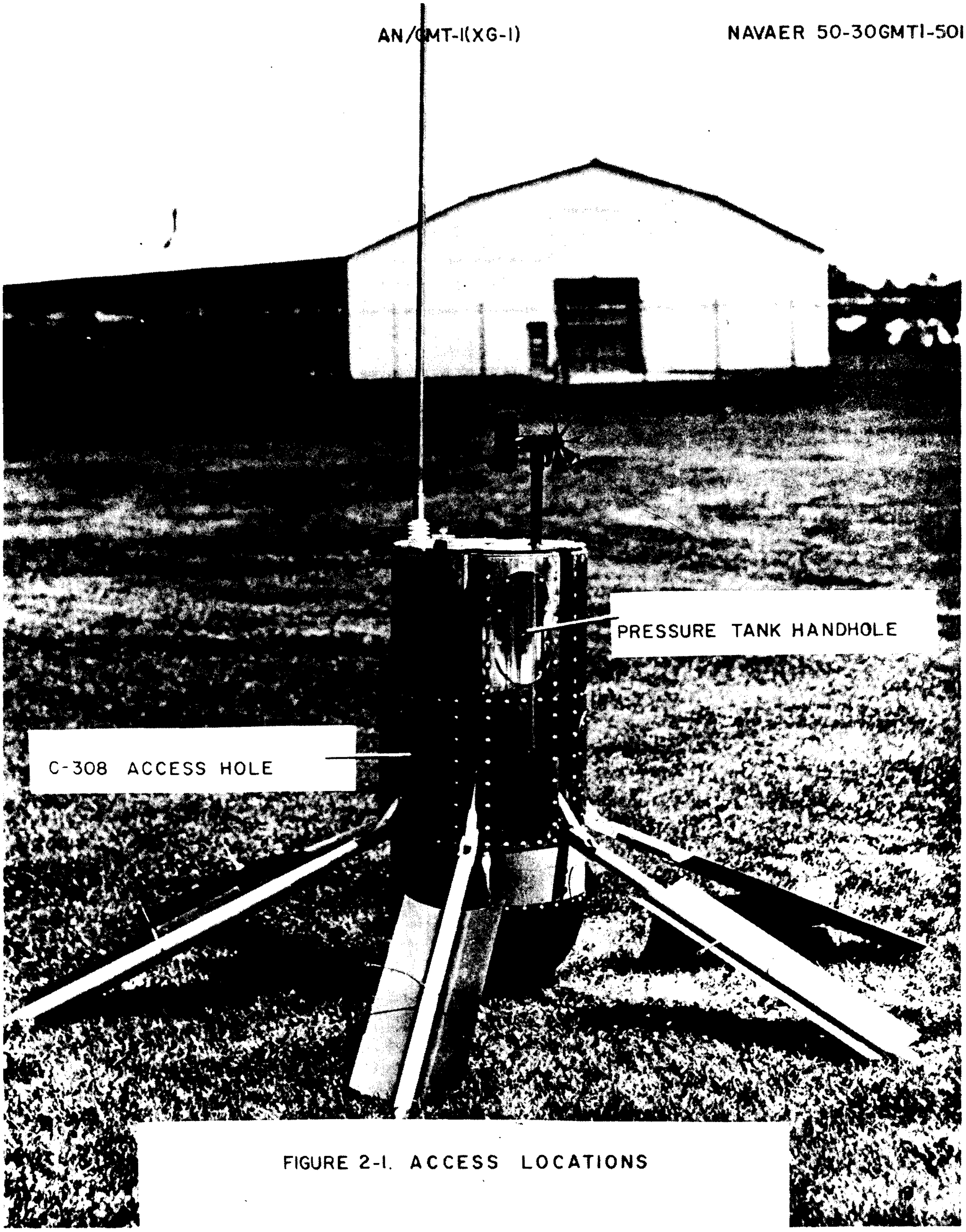

FIGURE 2-1. ACCESS LOCATIONS

2-13 TRANSMITTER TUNING The final tank coil of the transmitter must be tuned to resonance before the weather station is dropped. Since it will be dropped on areas of different conductivity, it is not expected that the power amplifier will always be tuned exactly to resonance. Off-resonance operation can be expected and in an extreme case, can reduce the power output as much as 5 or 6 DB. Such operation is unavoidable and will not damage the 2E-26 tube during the short period of operation. To adjust the loading of the transmitter:

1. Set up the weather station in some area clear of buildings, wires, etc., to avoid affecting the antenna loading.
2. Fully extend all legs and make sure they are locked in place with leg chaps installed.
3. Extend antenna to its full length.
4. Remove handhole cover "PROGRAM TIMER" and plug test unit into J-105. Turn main switch S-101 to ON (make sure safety switch S-702 is opened. This breaks circuit to hammer valve fusible wires.) and timer by-pass switch on the test unit to the ON position. When the 30 second warmup period is over, battery voltage will be indicated on the test unit.
5. Adjust the selector switch on the test unit to position 3 (P.A. Ip). Key transmitter on by closing carrier on switch.
6. Remove small snap button from panel over transmitter (See Figure 2-1). This gives screw driver access to tuning capacitor C-308.
7. Adjust C-308 to resonance by tuning for dip in plate current. This should be about 90 ma.

NOTE

Make sure this measurement is made with bridge amplifier plate voltage off.

Do not touch the station structure or leg chaps while making the above adjustment as this will affect the loading.

2-14 If it is not possible to adjust for this minimum plate current, it may be necessary to adjust the loading of the tank circuit more than by merely changing C-308. To do this set up the station per paragraph 2-13 parts 1, 2, and 3. Then:

1. Remove side panel covering the transmitter compartment.
2. Unsolder the antenna lead at E-301.
3. Remove the transmitter.
4. Remove the plastic cover over the tank coil.
5. Slide the transmitter back in place and connect the lead to the antenna.
6. Repeat steps 4, 5, 6, and 7 paragraph 2-13. Make small adjustments of the loading tap on coil L-303 as necessary.

NOTE:

Moving the tap toward the ground end of the coil increases the plate current when the tank circuit is in resonance.

Lowering the tap on L-303 decreases the resonate frequency of the transmitter and raising the tap lowers the resonate frequency.

The changing of the taps on L-303 for either loading or resonance purposes will affect the other to a degree.

2-15 If, during the tuning and loading procedure just described, the resonance of the tank circuit cannot be found, the wire from C-308 to L-303 will have to be changed to another turn on L-303. C-308 is a 5-15uuf condenser. The combination of L-303 and C-308 alone will not resonate at 4223 K.C. The antenna adds approximately 60uuf of fixed capacity to this circuit which should be sufficient for resonance. If the transmitter is to be temporarily operated out of the weather station proper, it should have a 100uuf variable condenser temporarily connected across C-308 so that resonance can be maintained during the operation. The tap on L-303 from C-308 acts as a coarse tuning of the resonate frequency and C-308 serves as the fine or vernier tuning.

CAUTION

When making final installation of the small snap button over C-308 access opening, make sure the opening is well sealed to prevent fine snow from entering the equipment.

2-16 BENCH TEST PROCEDURE To provide a complete test of the equipment, the station should be readied as for a drop except that the tail cone should not be installed. Lay the station horizontally on the ground. Pull the pin to start timer S-701. The station will erect itself and proceed to transmit when clock contact S-102 is made. The transmission can be monitored. With the test unit plugged in and the timer by-pass switch in the ON position, the equipment will operate continuously.

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SECTION III

OPERATION

3-1 GENERAL Automatic Weather Transmitting Set AN/GMT-1(XG-1) is a fully automatic equipment and requires no operator after it has been dropped at a location.

3-2 INTERPRETATION OF TRANSMISSION The transmitted information, in the form of three-letter code groups, using international morse code at approximately 17 words per minute may be received on any standard communications receiver. The frequency used is 4223 K.C. A Recorder, Code, Tape, RD-112/U can be used if available to provide a permanent record of transmission.

3-3 A transmission record similar to that shown in Table 3-1 should be used for recording the transmitted code groups and converting these groups to weather information.

TABLE 3-1

SAMPLE TRANSMISSION RECORD

Time of Last Transmission 0600
Time of Next Transmission 1800

Date 8/8/56
Time 1200
Weather Station A

CALL LETTERS	WIND DIR.	WIND VELOCITY	TEMP.	BAR. PRESS. HIGH	BAR. PRESS LOW
NBS	BVB	VTI	TMI	UBT	SNT
NBS	BVB	VTI	TMI	UBT	SNT

EVALUATION OF TRANSMISSION

Temperature correction applied to barometric pressures and wind velocity. (Obtain from calibration data sheets provided)

CODE LETTERS		
BVB	348	Degrees
VTI	16	Knots (Corrected)
TMI	+10	^{o}F
UBT	1004.2	Millibars (Corrected)
SNT	750	Millibars (Corrected)

3-4 Upon completion of a transmission, the code letters may be converted to weather data using the individual calibration data sheets supplied with each station.

CAUTION

Each station has a set of calibration data sheets peculiar to that station. Do not use any other data sheets.

3-5 The calibration data sheets are:

1. Code letters vs resistance (transducer) It is not necessary to use this during interpretation of a transmission.
2. Code letters vs Wind Direction degrees clockwise from reference line.
3. Code letters vs Wind Velocity in knots.
4. Code letters vs Temperature in ^{o}F.
5. Code letters vs Barometric Pressure (High range)
6. Code letters vs Barometric Pressure (Low range)

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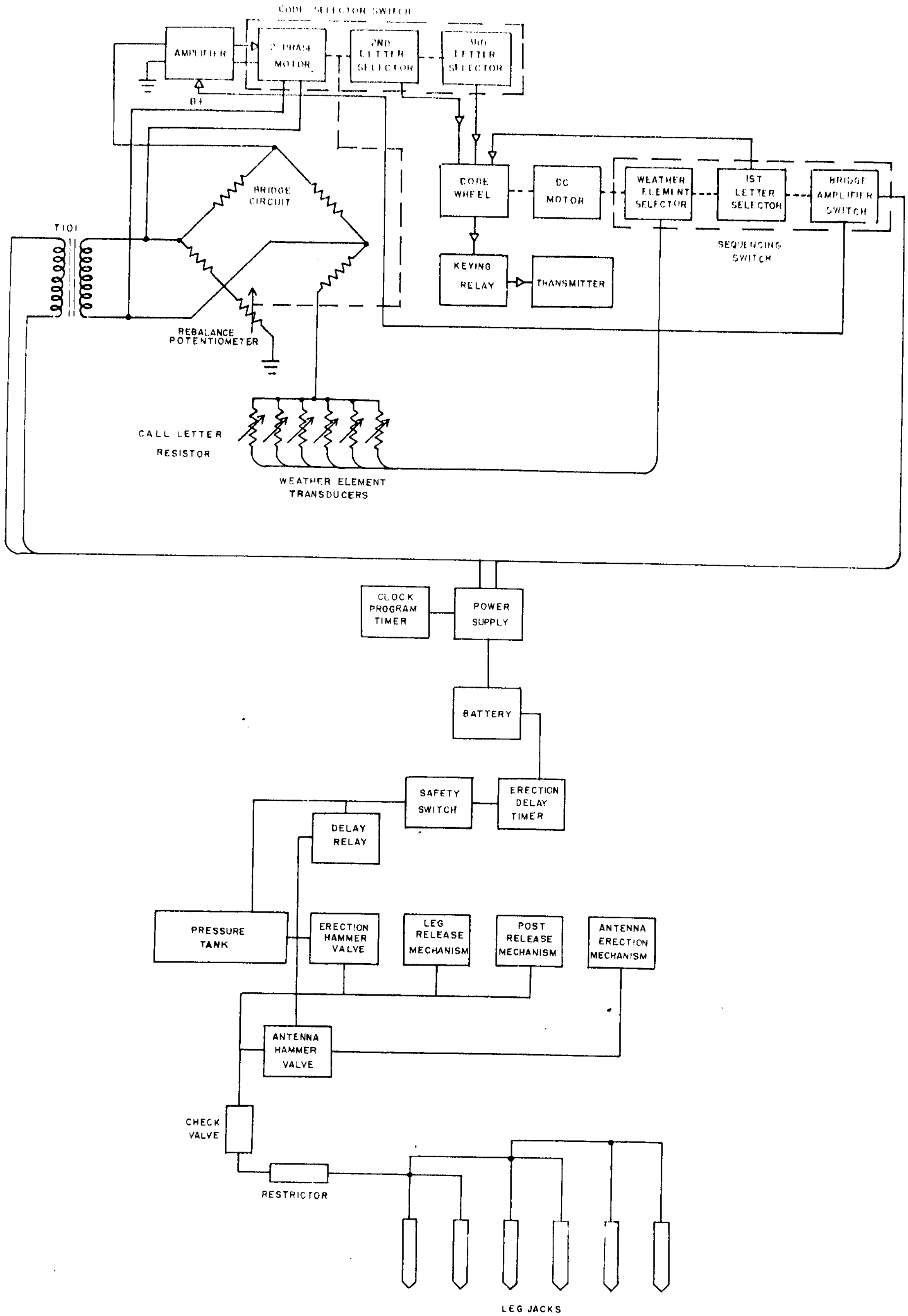


FIGURE 4—1 BLOCK DIAGRAM. AUTOMATIC WEATHER TRANSMITTING SET AN/GMT-1(XG-1)

SECTION IV

THEORY OF OPERATION

4-1 GENERAL

4-2 When the weather station is dropped from an aircraft, the static cord releases the tie-down cables thereby enabling the tail cone to be ejected. This will allow the parachute to be deployed and at the same time will pull a pin to start the erection-delay timer.

4-3 The weight of the weather station removes the pressure on the locking pin of the parachute ground-release assembly, allowing the pin to fall free in approximately 15 seconds. Thus, when the station hits the ground and removes the weight from the parachute ground-release assembly the parachute will be automatically disengaged.

4-4 The station will remain horizontal on the ground until the erection-delay timer closes a contact to fuse the wire which holds the spring-loaded self-righting hammer valve. When this happens, gas pressure will actuate the post release, leg release, and leg jacks. The station will be forced to erect itself perpendicular to the ground. The six legs will mechanically lock themselves in position to provide a positive support.

4-5 Approximately 15 seconds after the station has erected itself, the wire holding the spring-loaded antenna hammer valve will be fused, releasing the remaining gas pressure to erect the telescopic antenna. The station is then properly set up and ready to transmit weather information on its preset schedule.

4-6 A program timing clock governs the operation of the station from this time on. At pre-determined intervals the clock contacts start the transmission sequency. When the contacts close, all tube filaments have power applied to them and they are allowed to heat for thirty seconds. After this time operating voltages are applied to the entire equipment and it begins to transmit.

4-7 The station will first identify itself by sending call letters. Then each weather transducer in turn will be switched into a circuit to operate a servo system which will select code letters corresponding to the weather information. These code letters will then be transmitted. To insure adequate reception each item of weather information is repeated several times.

4-8 When the transmission is complete, a cam operated switch returns the system to its normal condition and it will remain so until the program timer initiates the next transmission.

4-9 BLOCK DIAGRAM (See Figure 4-1) This diagram includes both the electro-mechanical system and the pneumatic plumbing.

a. The electro-mechanical system consists of:

1. Safety switch
2. Erection delay timer and thermal delay
3. Antenna and self-righting hammer valves
4. Weather transducers
5. Bridge amplifier
6. Coding mechanism
7. Transmitter and antenna
8. Power supply and battery

b. The pneumatic system consists of:

1. Pressure tank with gauge
2. Self-righting hammer valve
3. Antenna hammer valve
4. Leg release mechanism
5. Post release mechanism
6. Antenna erection
7. Check valve and restrictors
8. Leg jacks and legs

4-10 DETAILED FUNCTIONING OF ELECTRO-MECHANICAL COMPONENTS (Refer to system schematic, Figure 7-1, in connection with nomenclature references.)

4-11 SAFETY SWITCH This is a normally closed, plunger-type switch, S-702 which is connected between the erection delay timer, S-701, and the fusible wire on the hammer valve assembly. This switch is necessary to break the electrical circuit to the fusible wires allowing electrical checks to be made after the hammers have been wired in place. This switch is opened by screwing in a thumb screw which is accessible from the outside of the station. It is located in such a position that one of the leg chaps will not fit properly until the thumb screw is removed. This is to insure that the station will not be dropped with the switch open.

4-12 ERECTION DELAY TIMER AND THERMAL DELAY The erection delay timer, S-701, is a spring-wound unit mounted on the top deck of the weather station and is used to provide a fixed interval between release from the aircraft and erection on the ground. It may be set for a fixed delay time of 1, 1½, 2, 3, 4, or 4½ minutes to allow sufficient time for the station to reach ground. Six holes are provided on the face of the timer corresponding to the desired delay. When the timer is set, a length of music wire is inserted into the desired hole. The handle of the timer rests against the wire. The other end of the wire is attached by means of a special wire clamp to the tail section in such a manner that it is held securely in place. This arrangement prevents the timer from operating until the wire is removed.

4-13 When the wire stop is pulled from the timer by the tail section ejection, the timer is free to operate. At the end of its time an electrical contact is closed and full battery voltage is applied to the fusible wire, F-702, mounted on the hammer assembly. The wire fuses and releases the hammer causing erection of the station.

4-14 The thermal delay is a relay, K-701, with a fixed delay of about 15 seconds. This delay provides a time interval between the erection of the station and the erection of the antenna. This is done to insure that the station will right itself and lock its legs in place before the remaining gas is used to erect the antenna.

4-15 The heater of relay K-701 is connected between the fusible wires F-702 and F-701. R-701 is a dropping resistance in series with the heater of K-701. The normally open contacts of the relay are connected in parallel with the heater. When timer S-701 closes, it applies battery voltage to wire F-702 which fuses, leaving the heater of relay K-701 through the fusible wire F-701. The heater current is not sufficient to fuse the wire and after 15 seconds, the relay contacts close, shorting the heater circuit and applying full battery voltages directly to the antenna release fusible wire F-701 which fuses, releasing the hammer and causing erection of the antenna.

4-16 ANTENNA AND SELF-RIGHTING HAMMER VALVES The hammer valves (See Figure 4-8) are two electrically triggered, hammer-actuated valves used to release the gas into the pneumatic system for self-righting of the weather station and erection of the antenna (See Paragraph 4-51). The hammers are secured in the armed position by a fusible hammer tie-down wire. When battery voltage is applied to each tie-down wire, it fuses the wire and releases the respective hammer. The spring-loaded hammer strikes the protruding end of a punch holder which actuates the pneumatic system.

4-17 WEATHER TRANSDUCERS All transducers operate a resistance element as an output. This output will vary from 0 to 2000 ohms depending on the weather information represented. This output serves as the input for the servo system.

CAUTION

The transducers should not be changed or tampered with since the calibration data supplied with the equipment applies only to the original units.

4-18 IMPELLER ANEMOMETER OPERATION This device is the transducer that provides wind speed and direction information.

a. The wind speed measuring method uses a propeller (or impeller) driven 4-pole magnet and a spring-loaded aluminum drag cup. The drag cup is placed in the magnetic field of the permanent magnet. When the magnet rotates because of the action of the wind on the impeller, a rotational force is imparted to the drag cup that is proportional to the speed of rotation of the magnet. A linear spring is anchored to the drag cup by the rotating magnet. A potentiometer is connected to the drag cup shaft by means of a flexible coupling. The potentiometer is linear, 0 to 2000 ohms. By properly adjusting the strength of the magnetic field and the strength of the retaining spring, the anemometer may be calibrated to read wind speeds from 0 to 80 knots.

b. The wind direction transducer is a weather vane that streamlines itself by heading into the wind. It is connected to a potentiometer by means of a ball bearing mounted shaft through the pedestal or base of the anemometer assembly. The wind direction transducer uses the physical structure of the Automatic Weather Station as its directional reference rather than the earth - it is therefore necessary to know the direction in which the weather station is oriented in order to properly determine wind direction from the code letters transmitted by the weather station. The means provided for determining the directional orientation of the weather fluoresc station consists of the red arrow or pointer formed by the painted stripes on the legs and top of the Automatic Weather Station. This arrow is easily visible from the air. The crew of the drop aircraft may, by using the instruments in the aircraft, determine the bearing of the arrow. The wind direction information transmitted from the weather station is on the basis of the heading of the arrow equal to 0 degrees - thus by knowing the bearing of the weather station and the direction of the wind in relation to the weather station, it is possible to calculate the bearing of the wind.

4-19 TEMPERATURE TRANSDUCER The temperature transducer consists of a 360° minitorque potentiometer actuated by loosely wound spiral core of bi-metal. The bi-metal core is wound so that it opens with the lowering of temperature and can turn the potentiometer as much as 720° over the temperature range from -70° to -140°F. The instrument should vary between 0 and 2000 ohms from -70° to about $+30^\circ$F. Then it should drop back to 0 ohms with further increase in temperature. As the temperature continues to rise, the resistance will increase until it again reaches approximately 2000 ohms at $+140^\circ$F. A fine mesh screen cover protects the bi-metal coil from handling and from larger pieces of dirt which might jam between the coils.

4-20 ATMOSPHERIC PRESSURE TRANSDUCER These are commercially manufactured transducers. There are two such transducers covering two ranges of barometric pressure. In order to provide continuity of pressure readings, the two ranges overlap. The high range covers from 12 to 15 psi or 820 to 1040 millibars. The low pressure range covers from 8 to 13 psi or 680 to 890 millibars.

4-21 BRIDGE AMPLIFIER The input to the bridge amplifier is taken from an AC bridge circuit. The bridge circuit consists basically of two fixed arms R401 and R402 and two variable arms. One variable arm consists of a fixed resistance R403 and the weather element transducer. The other variable arm consists of a fixed resistance R404 and a rebalance potentiometer R201. For maximum sensitivity R401 is made equal to R402 and the combined resistances of R403 and the weather element transducer are equal to the combined resistances of R404 and R201 at balance. The resistance values are such that the maximum current through the variable resistance of the weather element transducer should not exceed 15 milliamperes.

4-22 R201 is a specially constructed 360° rotation minitorque potentiometer. The first 30° of rotation (225 ohms) of R201 plus R404 (3545 ohms) total 3770 ohms which matches the value of R403 in the adjacent arm of the bridge. The next 300° of rotation add 2250 ohms to the circuit corresponding to the variable resistance of the transducer in the other variable arm. The last 30° of rotation of R201 is a open circuit.

4-23 The open circuited part of this potentiometer provides for overshooting when the rebalance motor is turning the potentiometer rapidly to a high value of resistance. When inertia of the motor carries the potentiometer arm over into the open circuit, a strong reverse torque is applied to the motor and to break its motion causing reversal of direction. This reduces the shock on the gear train by lessening its impact against the mechanical stop. If a weather transducer should develop an open circuit, reverse torque would be applied because R405 (1.8 megohms) is in parallel with these transducers. When the motor drives R201 rapidly toward a balance position of 1.8 megohms, the arm of R201 suddenly goes into the open circuit region. A reverse torque is then applied breaking the motor and causing a temporary reversal of direction. Under these conditions, holding will occur at the end of the resistance strip and the code selector switch may stop at random points in this region. If scattered readings occur in the vicinity of 2200 ohms, an open circuit in one of the instruments should be suspected.

4-24 As was previously mentioned the first 225 ohms of R201 in series with R404 is matched by single resistance R403 in the adjacent variable arm. In order to insure that the value of R403 and the value of R404 plus 225 ohms (of R201) vary in exactly the same way over the temperature range of the equipment, different temperature coefficients were selected for R403 and R404.

4-25 The bridge amplifier consists of a simple two-stage resistance coupled amplifier employing a 6B86 and a 6005 (V401 and V402 respectively). The AC bridge circuit discussed above is connected between the grid of V401 and ground. The connection between R401 and R404 and the connection between R402 and R403 is supplied with 115V at 115 cycles from the power supply unit. This same AC voltage is applied to one phase of the two-phase rebalance motor B201. The other phase of this motor is connected to the output of the amplifier. A 90° phase shift relation between the two voltages applied to the motor is obtained by means of a phase shifting capacitor C405 in the amplifier output circuit.

4-26 When the AC bridge is sufficiently unbalanced (approximately 2 ohms change in one leg) the AC voltage applied to the grid of V401 is amplified and fed to one side of B201. The motor rotates the rebalance potentiometer R201 in the proper direction to balance the AC bridge circuit, thus

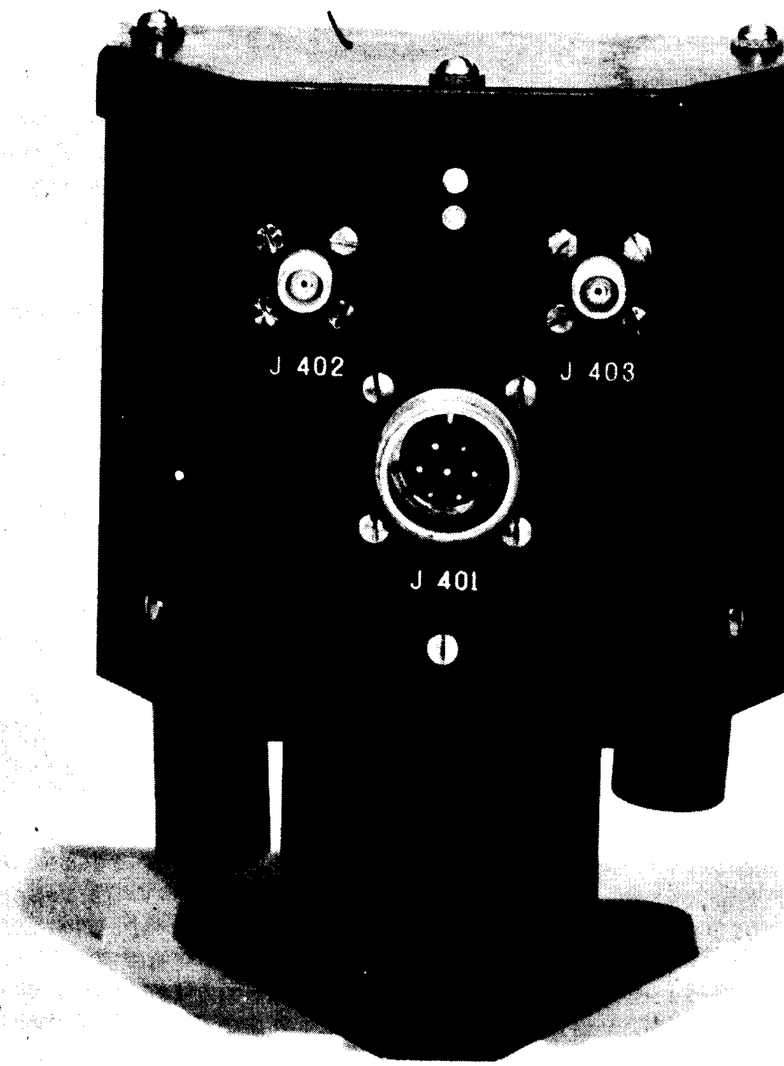


FIGURE 4-2. BRIDGE AMPLIFIER

reducing the voltage applied to the grid of V401 to approximately 0. The code selector switches S204 and S205 rotate with this motor (see paragraph 4-63) picking out particular letters for transmission.

4-27 Since the time allotted for bridge rebalance is only about 3 seconds, hunting or instability must be maintained at a minimum. This is accomplished by allowing some DC to flow in one side of the two phase motor thereby providing a measure of magnetic damping. R410 provides a DC path from B+ through the motor. The A.C. bridge, bridge amplifier, rebalance motor B201, and potentiometer R201 constitute the servo system.

4-28 CODING MECHANISM (See Figure 4-3) The code selection mechanism consists of two mechanical systems which are electrically connected. One system consists of a code wheel S203, a sequencing switch S201, and a cam operated switch S202, all powered by a 12V DC motor B202. The other mechanism, located at the top of the coding unit, consists of two 7 contact switches, S204 and S205, geared together through a 13 to 1 ratio and geared to a precision potentiometer R201. R201 is the rebalance potentiometer in one leg of the AC bridge circuit. This system is actuated by a two-phase motor B201 which tends to rebalance the bridge circuit. The two switches are wired to code wheel brushes. These two switches are identical and are made up of 7-contact buttons each and a two-pronged switch arm.

4-29 When a switch arm is touching only one button, the code selection mechanism sends the letter on the code wheel which is connected to that button. When the switch arm touches two buttons, the mechanism sends both letters simultaneously which results in a third letter (see Figure 4-5) The buttons are of such a diameter and spacing that the arc length travelled while the switch arm contacts a single button equals the arc length travelled by contacting two buttons simultaneously.

4-30 A mechanical stop is provided on the gear driving selector switch S204. This stop hits a spring held in a stop holder mounted on the side of the case. This stop prevents the mechanism from overshooting in case a high resistance or an open circuit is encountered in a weather transducer. This stop works in conjunction with the electrical braking feature described in paragraph 4-23.

4-31 There are three sets of brushes contacting code wheel S203. The brushes in sets two and three are wired to selector switches S204 and S205 respectively. Five of the nine brushes in set one are wired to brushes on the sequencing switch S201. Two brushes are wired through a single pole double throw switch S206, to a brush on the sequencing switch, S201i. S206 is used to select either I or N as the first letter of the call letter code group. The two end brushes of each set are common and are connected to the keying relay.

4-32 The sequencing switch performs several functions. It switches the weather element transducer resistance into the bridge circuit, applies

FIGURE 4-3 CODING MECHANISM

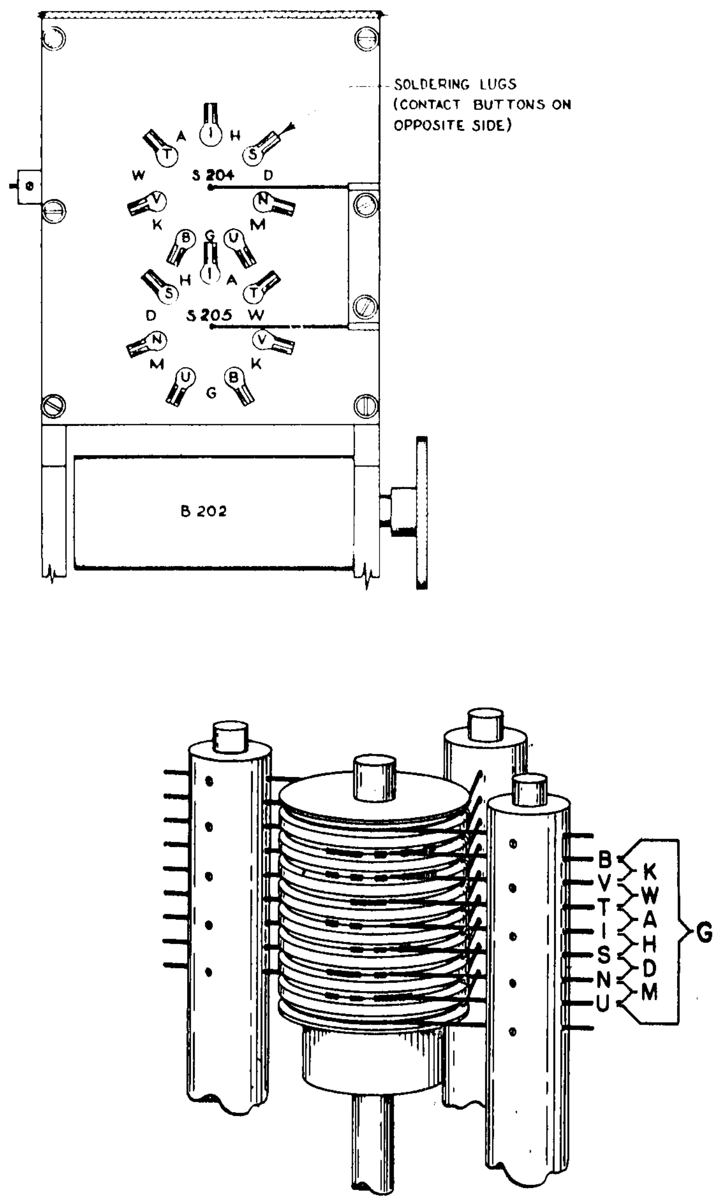


FIGURE 4-4. CODE LETTERS

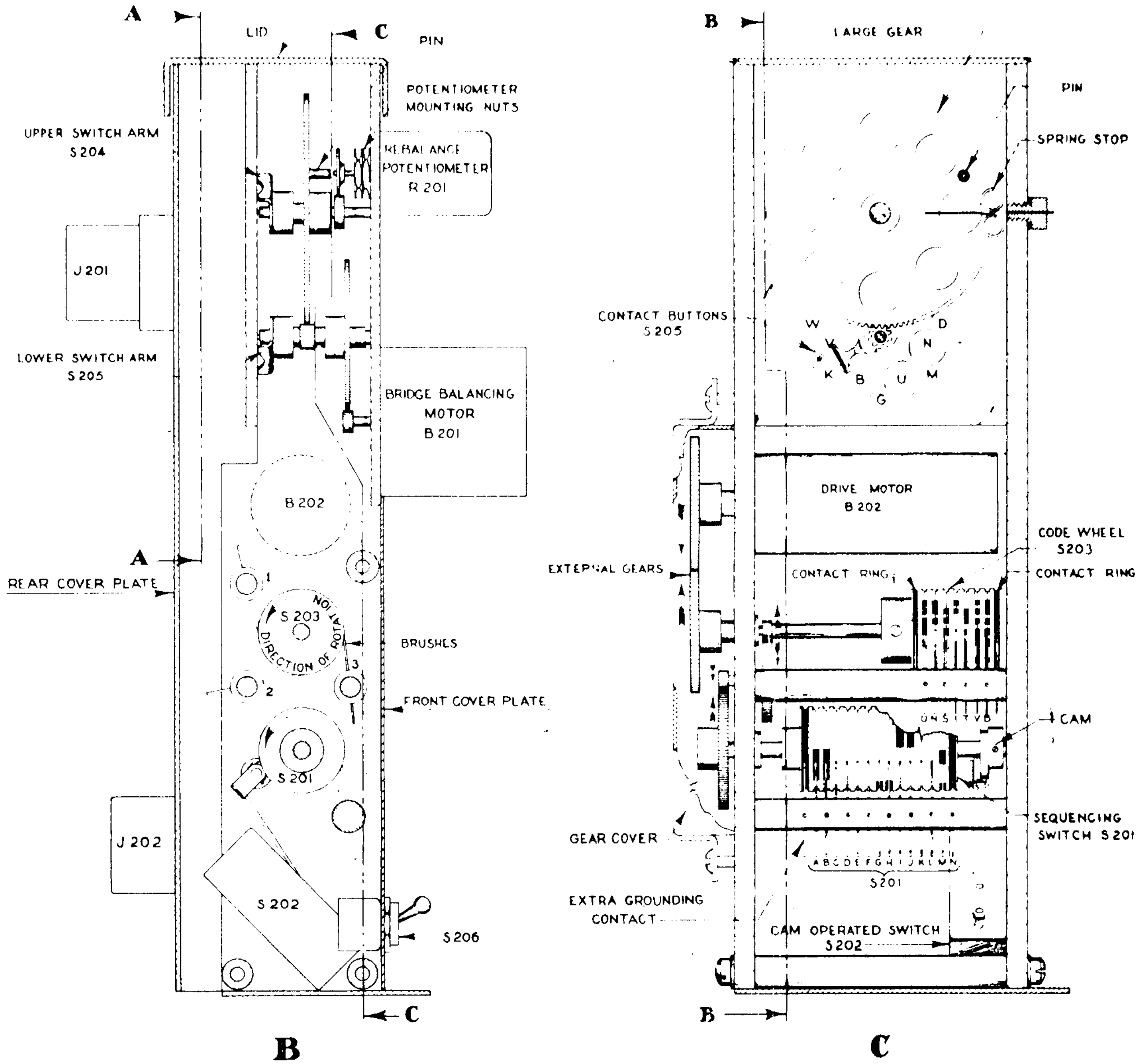


FIGURE 4- 5. CODING MECHANISM—DIAGRAM

voltage to the rebalancing circuit, and selects a code letter to identify the weather information being sent. It also switches a fixed call letter resistor R606 into the bridge circuit to cause the mechanism to send a call letter identifying the individual weather station.

4-33 The code wheel turns 20 revolutions for one revolution of the sequencing switch. Since the code wheel has three sets of brushes, three letters are sent for each revolution. The first letter is selected by the sequencing switch to identify the weather information being sent. These letters and the transducers they identify are as follows: N or I (as selected by S206) - - station call letters; B - - wind direction; V - - wind velocity; T - - temperature; U - - pressure, high range; S - - pressure, low range. The next two letters represent the quantitative information. This results in three letter code groups with spaces between each group. For a complete sequence of transmission see paragraph 4-63

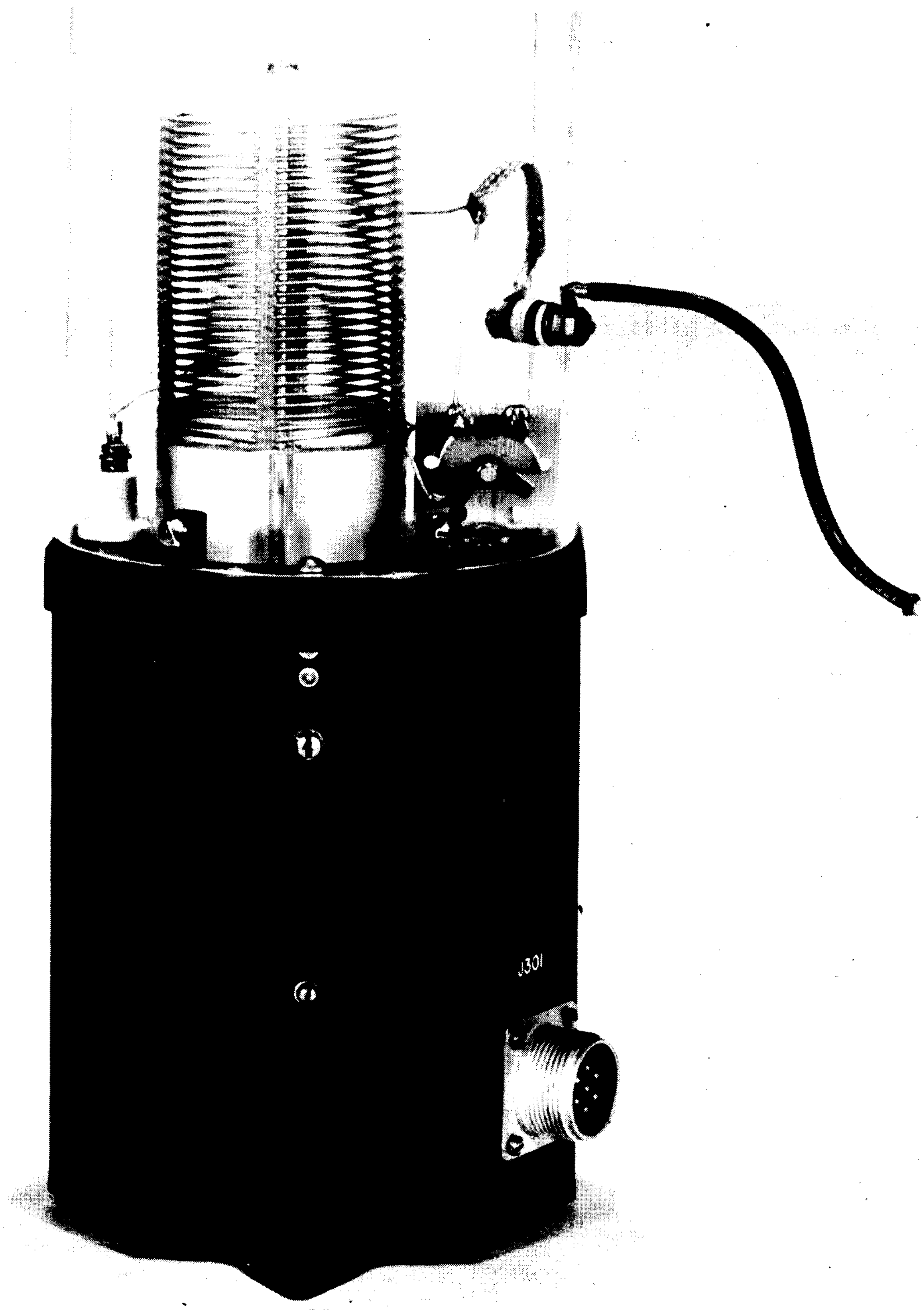
4-34 During a complete transmission, there are 40 turns of the code wheel and two turns of the sequencing switch. During the second revolution of the sequencing switch, the clock operated contact opens, leaving the cam operated switch S202 the only contact holding main relay K104 closed. Thus turning off of the equipment is assured at the proper location of the sequencing switch.

4-35 TRANSMITTER The transmitter (Figure 4-6) is enclosed in an aluminum case and mounted on the bottom deck next to the antenna. The final tank coil and trimmer capacitor are housed under a plastic cover which serves to protect these items from weather elements.

4-36 Type A1 transmission is employed, using international Morse code at approximately 17 wpm. The transmitter consists of a standard crystal oscillator and power amplifier arrangement; a 6C4 is used as a Pierce oscillator and drives a 2E26 class C power amplifier (see Figure 9-1). The main features of the transmitter and antenna coupling design are simplicity and ease of tuning. Only one tuning control and one tap adjustment are required. With full battery voltage the power output to the antenna is 15 watts. Shunt feed is used in the plate circuit of the power amplifier tube to prevent application of high DC voltage to the antenna.

4-37 A CR-18/u, AT-cut crystal is used in the crystal oscillator circuit, and is ground to 4223 KC plus or minus 0.03 per cent. Tank coil L-303 and trimmer C-308 form a resonant circuit with the antenna. Loading is accomplished by adjusting the plate tap on L-303. Moving the tap toward ground increases the plate current. C-308 and the tap on coil L-303 are adjusted during manufacture and should not have to be readjusted. The heater of the 6C4 is connected between ground and plus 6 volts; the heater of the 2E26 is connected between plus 6 and plus 12 volts.

NOTE: The heaters of the bridge amplifier tubes are connected between ground and plus 6 volts, thus evenly dividing the heater load on the battery.


J301

In a KEY UP condition, plate voltage is applied only to the 2E26. Keying is accomplished by a 6-volt DC keying relay (K-105) which simultaneously applied plate voltage to the oscillator and screen voltage to the power amplifier. K-105 is mounted in a hermetically sealed relay box in the power and timing unit.

4-38 The necessary measurements of the power amplifier voltage and current can be made with the test meter furnished with the equipment (see Section V paragraph 5-32). With the power amplifier loaded to about 95 ma plate current at 350 volts plate voltage, the following voltages are present (measured with a VTVM): oscillator 6C4--250 volts at the plate and -20 volts at the grid and power amplifier 2E26--180 volts at the screen grid and -62 volts at the grid. The combined oscillator plate current and power amplifier screen grid current is 20 ma.

4-39 Connection is made to the antenna by a lead to a lug on the antenna contact ring which is located on the base of the middle-deck antenna feed-through insulator. The set screw must be tightened against the antenna to make a good connection. The final tank coil must be tuned to resonance and the loading tap preset if necessary before the weather station is dropped. (See Section II, paragraph 2-13) Since the weather station will be dropped on areas of different conductivity, it is not expected that the power amplifier will always be tuned exactly to resonance. In fact, under various conditions, off-resonance operation can be expected; in the extreme case, this can reduce power output as much as 5 or 6 db. Such operation is unavoidable and will not damage the 2E26 during the short period of operation.

4-40 ANTENNA The antenna is composed of 5 telescopic sections of aluminum tubing which are automatically ejected by gas pressure to form a vertical whip antenna extending a little over 13 feet above the top deck of the station. The antenna is insulated from the structure of the station by two feed-through insulators in the middle and top decks and one base insulator at the bottom deck. Gas pressure is applied through a hole in the center of the base insulator to erect the antenna. Electrical connection to the antenna is made by means of a contact ring on the bottom of the second deck feed-through insulator. The antenna lead from the transmitter is connected to this ring.

4-41 POWER SUPPLY AND BATTERY (See Figure 4-7) The power supply is mounted on the lower deck of the station and the battery is located in the hemi-spherical nose section. The power supply includes a conventional vibrator unit, a transformer, hermetically sealed relays, delay relay, and a modified D.C. clock for tuning transmission schedules. The clock mechanism is adjusted for an accuracy of $\pm$10 minutes over a two-week period.

4-42 When the main switch S-101 is in the OFF position, all voltages are removed from the equipment. Placing this switch in the ON position applies 6 volts to the clock mechanism, 12 and 6 volts to the normally open contacts of relay K-104, and 12 volts to the contact of self-righting delay

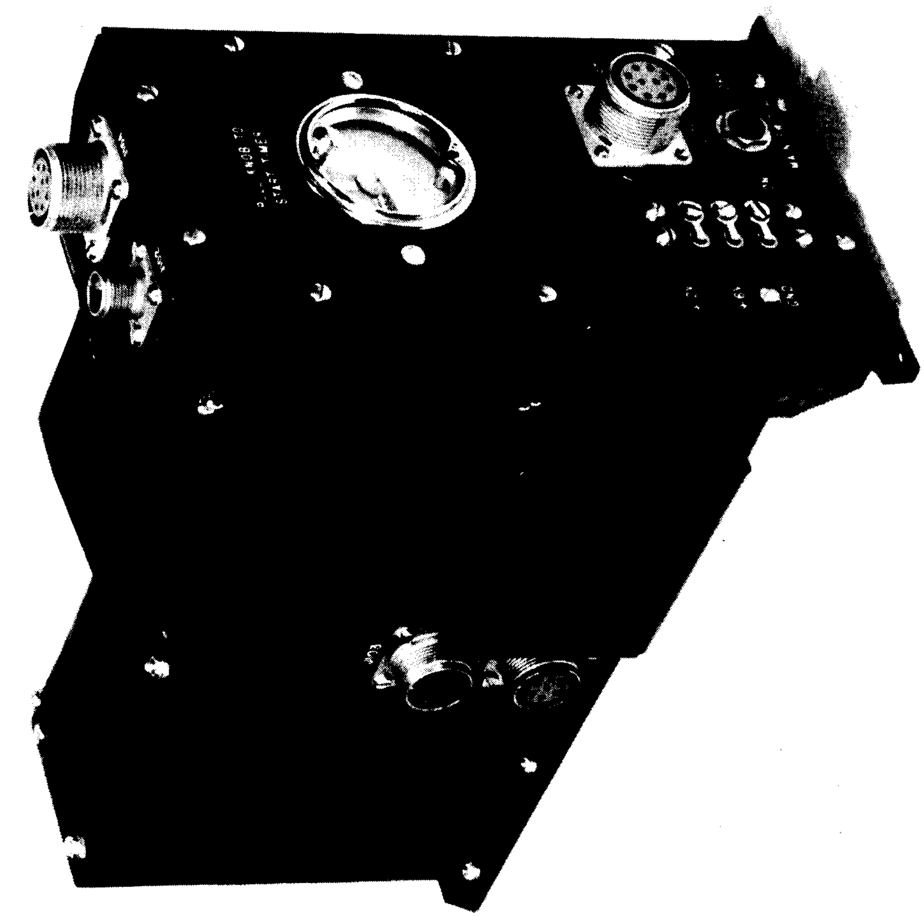


FIGURE 4-7 POWER SUPPLY

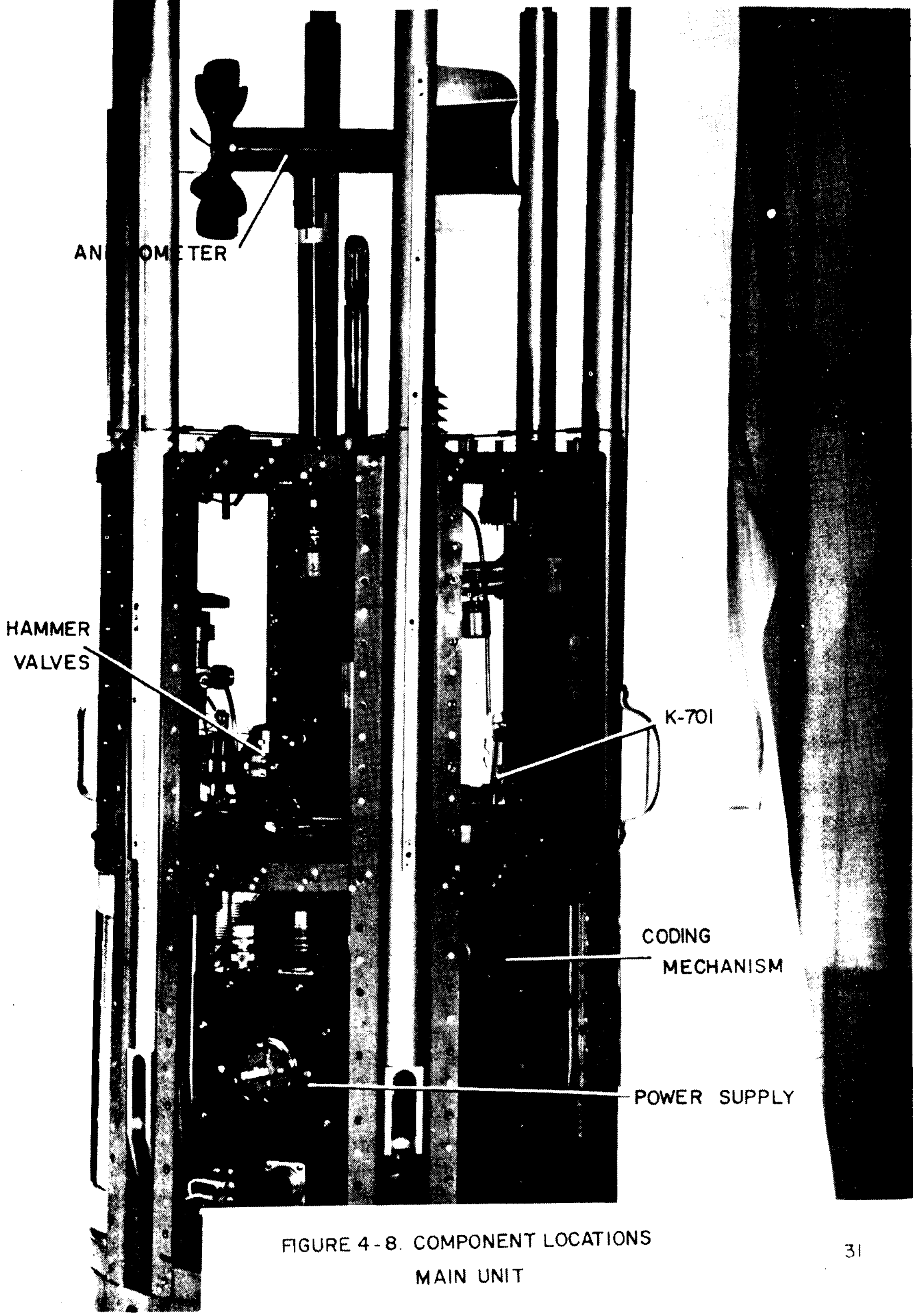


FIGURE 4-8. COMPONENT LOCATIONS
MAIN UNIT

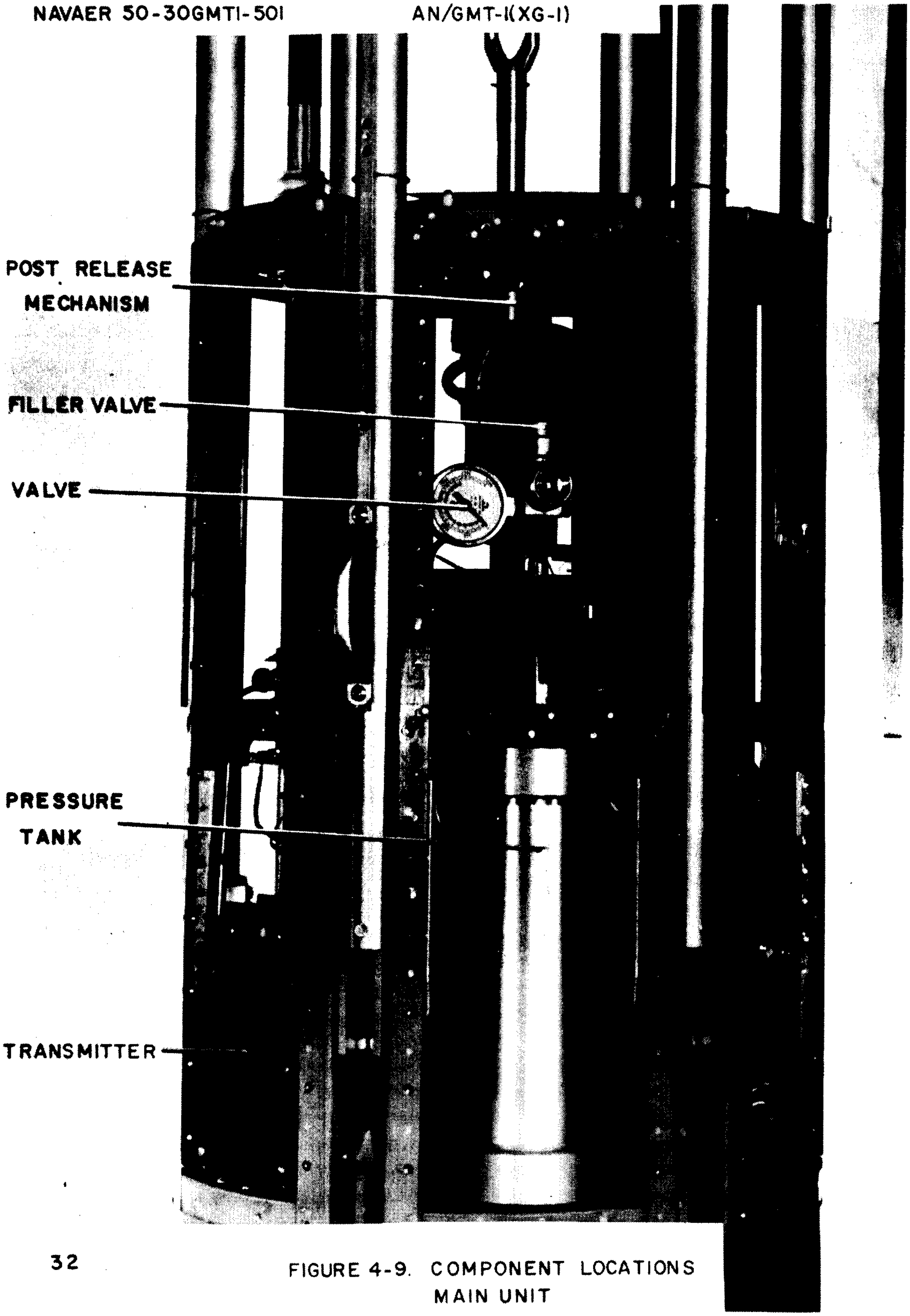


FIGURE 4-9. COMPONENT LOCATIONS MAIN UNIT

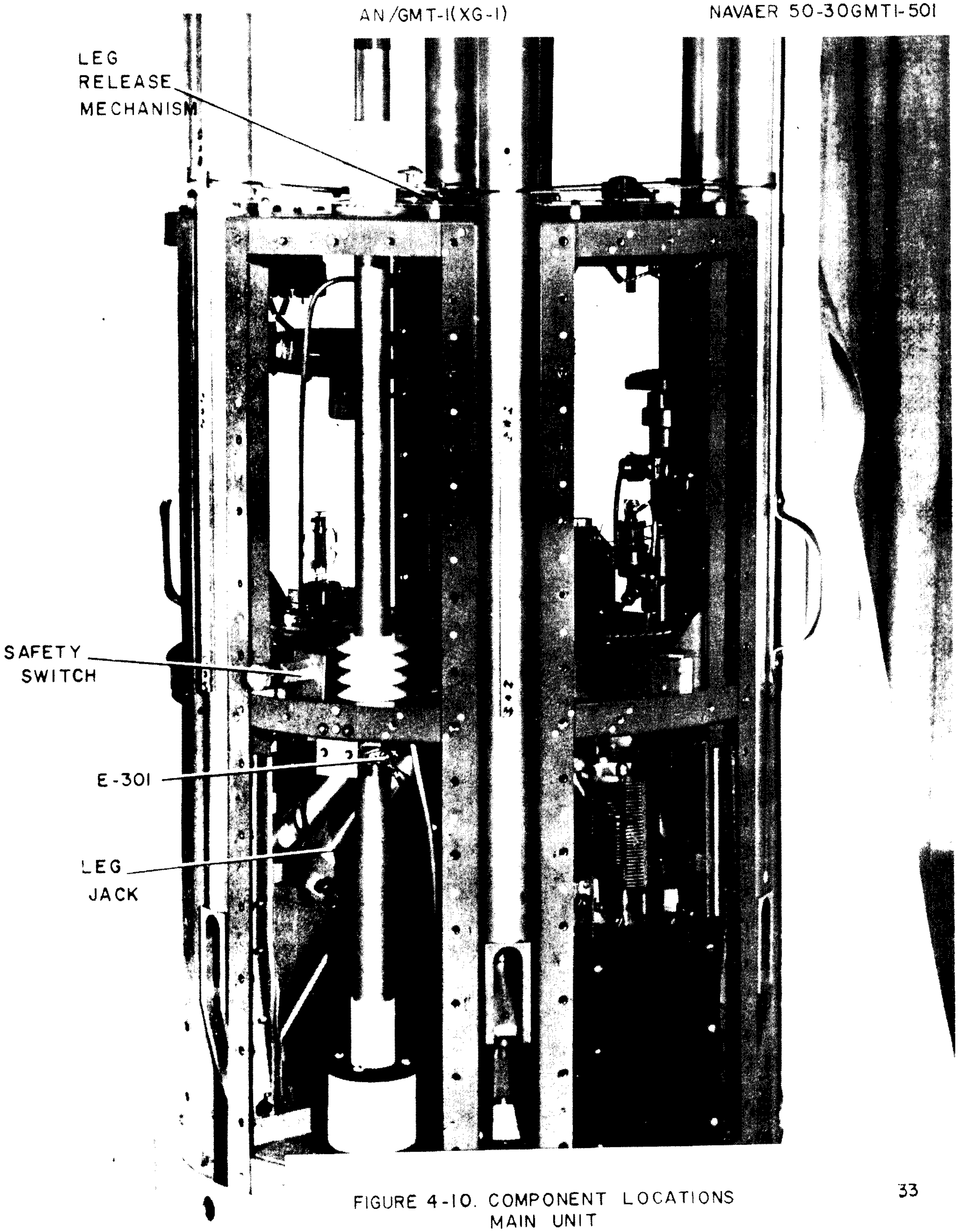


FIGURE 4-10. COMPONENT LOCATIONS
MAIN UNIT

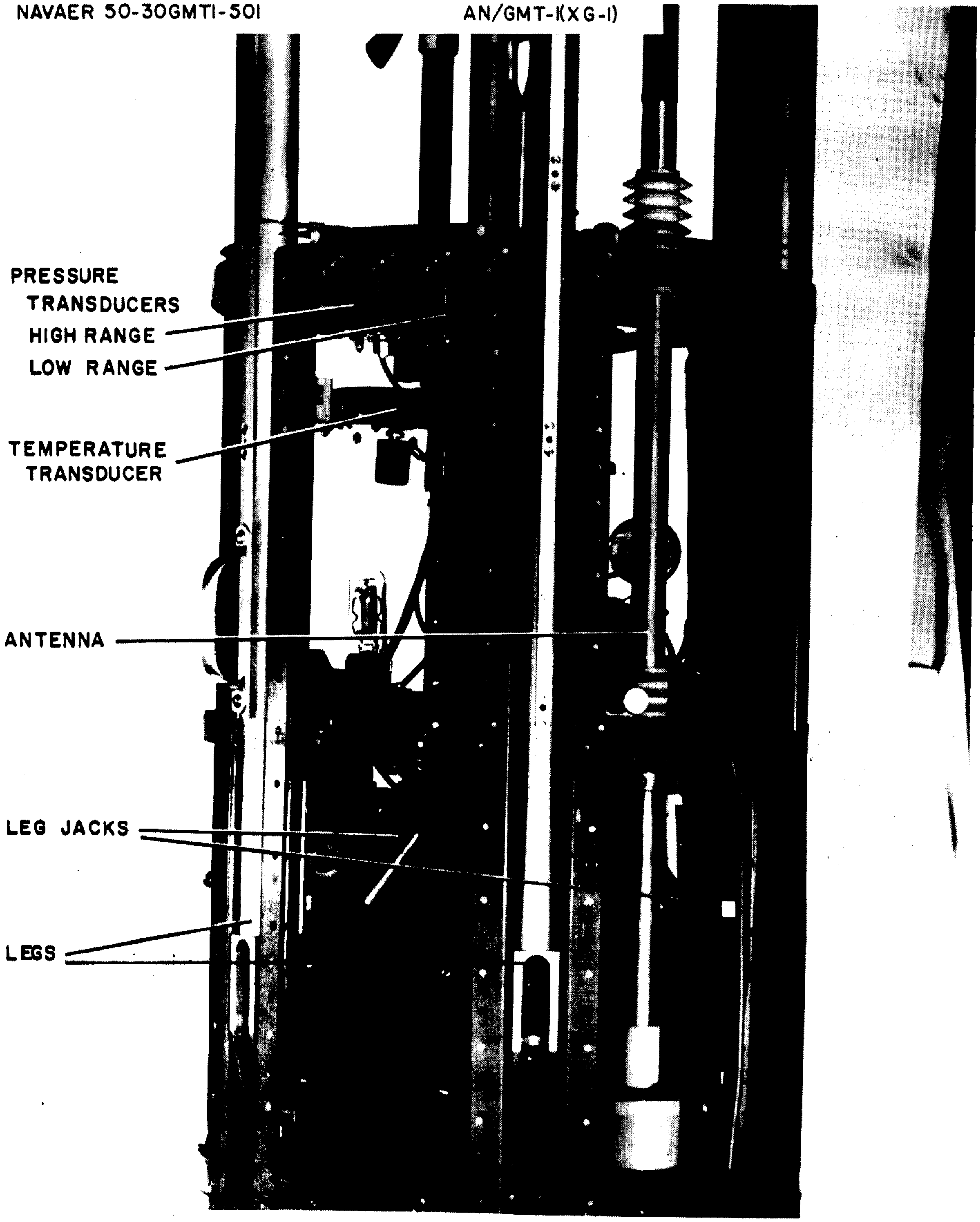


FIGURE 4-11. COMPONENT LOCATIONS
MAIN UNIT

timer S-701. When this timer contact closes, it applies 12 volts to F-702, F-701, and K-701, causing self-righting and antenna erection. Nothing more is actuated until the contacts of the clock, S-102, close. (These contacts are arranged to close at 12 and 6 o'clock to provide a transmission every six hours. The contact area on the face of the clock is arranged so that a transmission every three hours can be programmed simply by soldering in two extra contact areas located at 3 and 9 o'clock.)

4-43 When the clock contacts close, relay K-104 is energized. This applies voltage to all vacuum tube heaters, the heater of thermal time-delay relay K-101, and the coil of keying relay K-105 (This relay will not be energized however until the code wheel S-203 begins to revolve during transmission.) After 30 seconds, K-101 contacts close and energized relay K-103. This relay applies 12 volts to the vibrator power supply VP-101, motor B-202, and bridge amplifier relay K-102. Thermal relay K-101 is removed from the circuit at the same time and a pair of holding contacts maintain the coil of K-103 energized as long as 12 volts is applied.

4-44 When the motor, B-202, starts, the cam operated micro-switch, S-202 (wired in parallel with the clock contact S-102) closes. This parallel arrangement insures two complete revolutions of the sequencing switch and consequently the transmission of two complete sequences of weather information. S-202, in parallel with the clock contact, provides a positive contact to hold K-104 closed. At the end of one revolution of the selector switch, S-202 closes. But, since S-102 is still closed, K-104 remains energized, B-202 continues to operate, and S-202 again closes. Before another revolution of the sequencing switch, S-201, is completed, the clock contact opens and K-104 is de-energized. This removes all voltages to the electrical equipment except the clock mechanism. Transmission stops and the equipment is in stand-by condition until the clock contact again closes to start the next transmission cycle.

4-45 The vibrator power supply VP-101 has a D.C. output voltage of 375V unloaded. The current drain is about 115 milliamperes to the transmitter and 40 milliamperes to the bridge amplifier. This vibrator supply also provides 115 cycles alternating current for operation of the rebalance motor and bridge circuit.

4-46 The bridge amplifier relay, K-102, is energized by contact S-201m on the sequencing switch, S-201, and applies plate voltage to the bridge amplifier and 24 volts A.C. to the primary of T-101. T-101 supplies 115V A.C. at 115 cps to the A.C. bridge circuit and rebalance motor. Thus the bridge circuit operates only when relay K-102 is energized.

4-47 The four relays, K-101, K-102, K-103, and K-104, are mounted in a hermetically sealed unit which plugs into a 20 contact socket.

4-48 Connections are made from the power supply to the transmitter, bridge amplifier, and code selection mechanism by means of cables which terminate in connectors that are potted for waterproofing and reduction in size. Power is supplied to the fusible wire for self-righting antenna erection through connector J-102 mounted on the top of the power supply and timing unit.

4-49 The test meter can be plugged into J-105 on the front panel. Three meter shunt resistors, R-101, R-102, and R-103, for current measurement are mounted on the terminal strip E-103. All interconnections in the power supply are made on terminal strips E-101 and E-103.

60

4-50 The battery used is a nickel-cadmium 16 ampere-hour unit composed of 11 active cells and 1 dummy cell. The assembly is mounted in a case which is housed in the nose section of the station. When fully charged, the battery voltage is 13½ volts.

4-51 DETAILED FUNCTIONING OF PNEUMATIC SYSTEM

4-52 PRESSURE TANK AND GAUGE The pressure tank is mounted on the lower deck (See Figure 4-9). A connection on the top of the tank extends to the upper deck. At the upper deck level a pressure gauge and filler valve are attached. The take-off point for the pneumatic system is also at this point. This tank has been tested at 2000 psi pressure without showing signs of yield (See Section II, paragraph 2-10 for charging instructions).

4-53 SELF-RIGHTING HAMMER VALVE AND ANTENNA HAMMER VALVE (See Figure 4-8) These are electrically triggered hammer actuated valves used to release the gas into the pneumatic system for self-righting the weather station and direction of the antenna. These two hammer valves are identical and consist of the following major parts:

1. Hammer and associated torsion spring
2. Punch holder
3. Punch
4. Plug
5. Plug fitting
6. Union (special)
7. Main valve body (holds punch holder and plug fitting)
8. Hammer tie-down fusible wire
9. Tie-down lug, self-assembly
10. Crush Washer

4-54 The main valve body is used as part of the hammer framework. The hammers are secured in an armed position by the fusible tie-down wire. The punch holder is placed in the main valve body with the stem protruding through the inner wall so that the hammer will strike it when released. The punch holder and the valve seat in the main valve body form a gas-tight seal. The punch is inserted in the punch holder sharp side out. The gas seal plug is placed flat side down in the plug holder fitting, and the union is securely tightened against it. The aluminum crush washer, used to form a gas-tight seal, is placed on the plug holder fitting. The fitting is installed in the main valve body and tightened. Gas pressure applied directly to the union is sealed off by the plug. The operation of the hammer valve is as follows:

1. Voltage is applied between the tie-down plug and the weather station framework.
2. This causes the 0.010 inch wire to fuse and release the hammer.
3. The spring-loaded hammer swings down striking the protruding end of the punch holder.
4. This drives the punch through the aluminum plug.
5. Gas flows through the small openings in the punch driving the punch holder back against the valve seat forming a gas-tight seal.
6. Gas also flows through the punch into the pneumatic system causing self-righting of the station and direction of the antenna.

4-55 LEG RELEASE MECHANISM (See Figure 4-10) The legs of the weather station are secured in place by 3/32 inch flexible steel cables connected to a leg release assembly mounted on the top deck. The leg release assembly is a pneumatically operated device for disconnecting the leg hold cables at the start of the self-righting operation. If it is desired to set up the station manually for testing, pull up on the leg release assembly to free the leg hold cables and lower the legs to the locked position.

4-56 POST RELEASE MECHANISM (See Figure 4-9) The parachute connection to the main unit of the weather station is by a spring-loaded post mounted in a special fitting in the center of the top deck. This post is secured in place by a plunger extending through its lower end. When gas pressure is applied to the system for self-righting, this plunger is removed by the pneumatic jack of the post release mechanism. This support post is spring-loaded and when the locking plunger is removed, it allows the post to be ejected, leaving the top deck free of all obstructions and providing a positive means of releasing the parachute should the parachute ground release feature fail.

4-57 ANTENNA ERECTION 15 seconds after the station has righted itself, gas pressure is applied through a hole in the center of the base insulator of the antenna. This pressure forces the telescopic sections of the antenna to be erected. The sections are so contructed that they will gall upon erection and thus will be mechanically secured after the gas pressure has leaked off.

4-58 CHECK VALVE AND RESTRICTORS A check valve is installed in the main gas line leading to the leg jacks. This check valve allows gas to flow unrestricted to the leg jacks but prevents return flow when pressure in the tank is exhausted during antenna erection.

4-59 A restrictor with a 0.024 inch opening is placed in the tubing leading to the leg jacks. This is necessary to prevent application of full pressure to the jacks of the legs not in contact with the ground. These legs are forced outward to their final position immediately, and the sudden application of pressure would fracture the cylinder cap when the piston reached the end of its travel.

4-60 LEG JACKS AND LEGS (See Figure 4-10) Six pneumatic jacks are used to force the legs outward and downward during self-righting. Each jack is equipped with a locking ring which drops into a groove in the connecting tube as it reaches the end of its travel. This locks the legs in position to hold the station upright.

4-61 The six legs, constructed of aluminum tubing, are hinged to the station structure near the lower deck level. They are connected to the pneumatic jacks in such a way that the jacks force them outward and downward. When prepared for dropping, the legs are folded into channels along the side of the station and secured by leg hold cables. Points at the end of the legs minimize sliding on ice or steep slopes. The legs are of sufficient length to hold the station upright on surfaces sloping as much as 45 degrees and to withstand winds over 80 knots.

4-62 PARACHUTE GROUND RELEASE ASSEMBLY (See Figure 4-12) The parachute ground release assembly is connected to the center supporting post of the weather station and fastened in position by a light breakable cord. This assembly is equipped with a spring-loaded plunger that holds a supporting eye against the locking pin preventing the pin from dropping out prematurely. This pin closes the mouth of the hook preventing release during the interval the parachute is opening and the suspension line tension is unstable. When the weather station is released from the aircraft and the parachute opens, the weight of the weather station forces this supporting eye to drop down into the hook, compressing the spring-loaded plunger, and removing the side pressure from the locking pin. The locking pin, which is an accurate fit into the socket, slowly slides out and will fall clear in about 15 seconds, opening the mouth of the hook assembly. Because of the time required for the pin to drop free, the parachute and its load are allowed sufficient time to steady down and float gently earthward. The moment the weather station contacts the ground, weight is removed from the hook assembly and the spring-loaded plunger ejects the hook from the supporting eye allowing the parachute to float free.

4-63 DETAILED SYSTEM OPERATION

1. The weather station is released from the aircraft.
2. The static cord releases the tail cone tie-down cables.
3. The tail cone is ejected, deploying the parachute and pulling the timer wire which starts the erection-delay timer.
4. The weight of the station removes the pressure on the locking pin of the parachute ground-release assembly allowing the pin to fall free in about 15 seconds.
5. The station hits the ground removing its weight from the parachute ground-release assembly which automatically disengages and the parachute floats free.

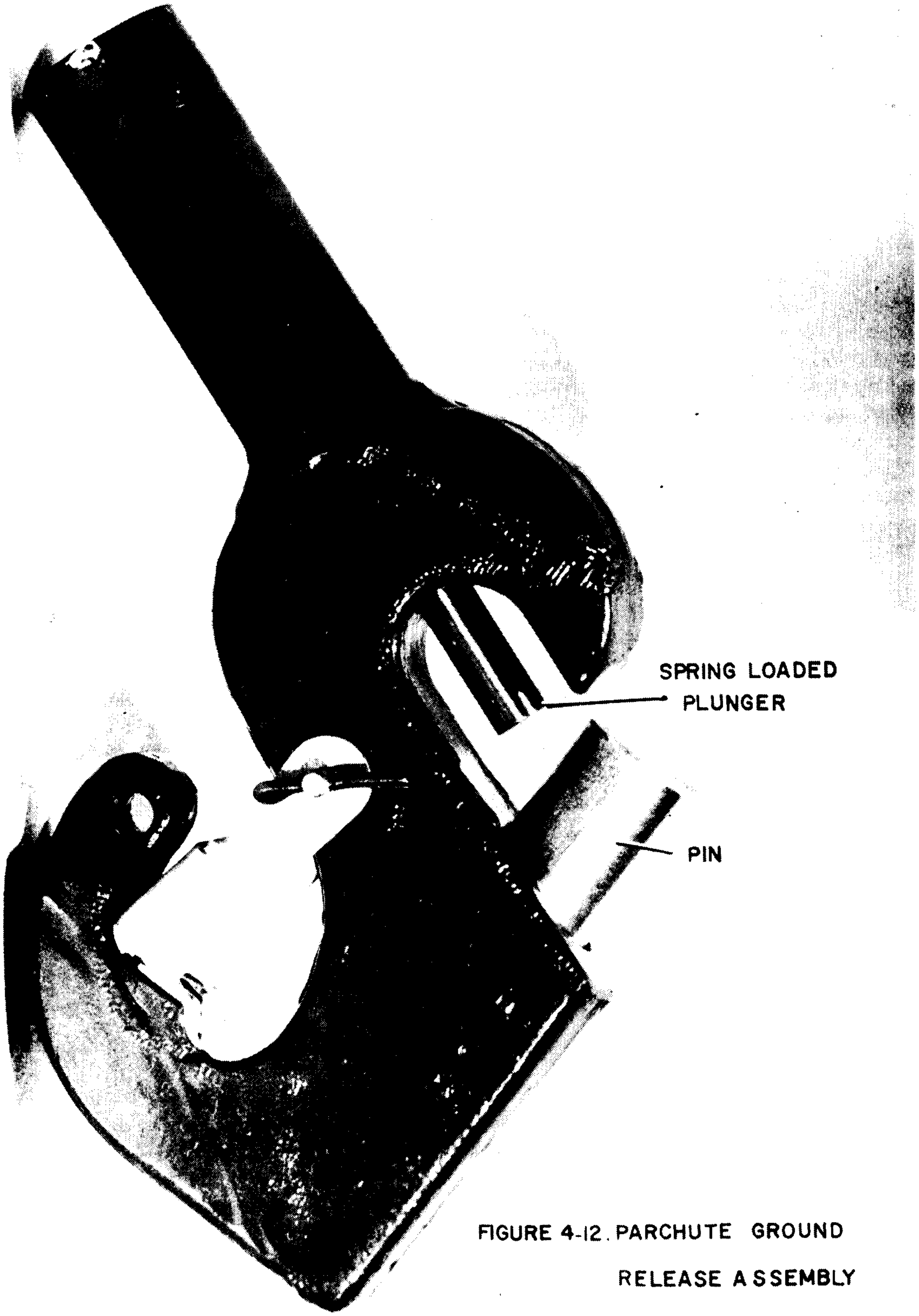


FIGURE 4-12. PARCHUTE GROUND RELEASE ASSEMBLY

6. The station remains horizontal on the ground until timer S-701 contacts close, fusing wire F-701.

7. The released hammer allows gas pressure to actuate the post release, leg release, and leg jacks. This erects the station perpendicular to the ground. The four fins fall free.

8. 15 seconds later thermal delay relay K-701 closes and fuses wire F-701. The hammer valve thus released allows remaining gas pressure to erect the antenna. The station is now completely erected and ready to operate.

9. At the prescribed transmission time, the time clock contact, S-102, is closed, energizing relay K-104, applying battery voltage to vacuum-tube heaters and to thermal delay relay K-101.

10. After 30 seconds relay K-101 closes its contacts. This energizes relay K-103 which in turn applies 12 volts to the vibrator power supply and coding mechanism motor B-202. Heater voltage is removed from K-101 allowing its contacts to open. The equipment is now entering its transmission sequence.

11. In the coding mechanism code wheel S-203 and sequencing switch S-201 are turned continually by motor B-202. On the sequencing switch contact S-201i is closed as the transmission starts. This selects the first letter of the call letters to be sent. (N or I depending on setting of S-206) As the code wheel contacts come under the brushes of the first group of brushes, the brush which is connected to ground by S-201i will operate keying relay K-105. This keys the transmitting and sends the first letter. Sequencing switch contact S-201j connects call letter resistor R-606 to the bridge circuit. S-201m applies 115 volts A.C. to the bridge and B+ to the bridge amplifier.

12. The bridge rebalances by causing motor B-201 to operate R-201 until the amplifier has no input. In so doing the motor has also moved S-204 and S-205 to positions corresponding to the value of R-606. S-204 will be connected to one or two brushes of the second brush group of code wheel S-203. S-205 will be connected to one or two of the third brush set. As the code wheel S-203 continues to turn the brush or brushes of the second group now connected to S-204 will operate keying relay K-105. Thus the second letter of the first code letter group will be transmitted. The third set of brushes will send the third letter.

13. Sequencing switch contacts S-201i and S-201j are still made and as the code wheel contacts pass the first, second, and third set of brushes, the same three letters already transmitted will be repeated. This forms the second group of call letters. A total of four call letter groups of 3 letters each will be sent.

14. Sequencing switch contacts S-201i and S-201j now lose contact with their respective brushes and S-201a and S-201b made contact. S-201a selects the first brush of the code wheel character "B". S-201b selects the weather transducer for wind direction and switches it into the bridge circuit. S-201m will apply voltages to rebalance the bridge to its new position depending on the resistance of the wind direction transducer. As code wheel S-203 continues to turn, it will send the letter "B" to identify the transducer and then the two letters selected by the new position of S-204 and S-205. Switch segments S-201a and S-201b are of such length that code wheel S-203 will turn 3 times before they open contact. This allows the wind

direction group of 3 letters to be repeated three times. All the transducer segments of S-201 are long enough to repeat each weather information three times in turn.

15. Following wind direction will be three groups of letters of 3 letters each for wind velocity, temperature, high pressure range, and then low pressure range.

16. One cycle of transmission is complete and the call letter segments S-201i and S-201j now contact again. These call letter segments are long enough to allow the code wheel S-203 to make 5 complete revolutions instead of three. The 3 call letters will be sent 5 times now. At the end of the first 3 letter group, S-202 is opened by the cam on the shaft of S-201. However, the clock contact is still made and the equipment now enters its second cycle of transmission.

17. Following the call letters all weather information will be sent as before.

18. At the end of this second cycle of transmission call letter segments S-201i and S-201j will again be made. One call letter group of 3 letters will be sent. At this point cam-operated contact S-202 again opens. Clock contact S-102 will now be open allowing S-202 to de-energize relay K-103. The transmission now stops and will not start again until clock contact S-102 is again closed. Since one call letter group has been sent, the next transmission in each case starts with 4 call letter groups.

4-64 A complete transmission sequence is shown in Table 4-1.

TABLE 4-1

ORDER OF TRANSMISSION	CODE GROUP SENT	TIMES REPEATED
1	Call Letters	4
2	Wind Direction	3
3	Wind Velocity	3
4	Temperature	3
5	Atmospheric Pressure (High Range)	3
6	Atmospheric Pressure (Low Range)	3
7	Call Letters	5
8	Wind Direction	3
9	Wind Velocity	3
10	Temperature	3
11	Atmospheric Pressure (High Range)	3
12	Atmospheric Pressure (Low Range)	3
13	Call Letters	1

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SECTION V

MAINTENANCE

WARNING

AUTOMATIC WEATHER TRANSMITTING SET AN/GMT-1(XG-1) DEVELOPS VOLTAGES WHICH ARE DANGEROUS TO LIFE. MAINTENANCE PERSONNEL MUST OBSERVE SAFETY PRECAUTIONS AT ALL TIMES. READ AND UNDERSTAND ALL INSTRUCTIONS BEFORE ATTEMPTING TESTS OR ADJUSTMENTS.

5-1 GENERAL Automatic Weather Transmitting Set AN/GMT-1(XG-1) should require no maintenance, other than visual inspection, except after each operation of the pneumatic system during test and after each drop of the station.

5-2 Following any operation of the hammer valves the plug, crush washer, and fusible tie-down wire must be replaced. The punch should be visually examined for damage or dullness, if necessary a replacement from the spare parts should be installed. The punch holder should then be lightly oiled with MIL-L-6085A lubricant.

5-3 MAINTENANCE REQUIRED FOLLOWING A STATION DROP When a station is recovered following a drop, it will require maintenance to ready it for another operation consisting of:

1. Replacement of nose section and foamed plastic insert.
2. Replacement of tail cone.
3. Battery charge and complete electrical system checks.
4. Pneumatic system charge and check.
5. Complete visual inspection and repair of any damage found.
6. Parachute replacement or re-pack.

5-4 To replace the nose section remove the old one by removing all screws holding it in place. If not too badly damaged, it can be used again after pounding out dents to restore original shape. The foamed plastic insert will have to be replaced if damaged.

5-5 The original tail cone will probably be damaged beyond repair. It is doubtful if it can be salvaged. [illegible]

5-6 The battery should be recharged (See Section II, paragraph 2-7) and the complete electrical system operation check made as follows:

1. Tune the transmitter per Section II paragraph 2-13.
2. After the transmitter has been tuned, turn main switch S-101 to OFF. Place the timer by-pass switch in the OFF position and the carrier switch in the OFF position.
3. Manually operate the clock contact by using the knob so that the contact is almost made.
4. Place main switch S-101 in the ON position.
5. The clock should now operate and as soon as its contacts close, the station should enter a normal transmission cycle.

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6. The output of the transmitter should be monitored.

5-7 The pneumatic system should be charged per Section II, paragraph 2-10. All plumbing of the system should be given a thorough visual examination for damage of any kind.

5-8 A thorough visual inspection should be made of the entire unit. Any part damaged should be repaired or replaced. The silicone rubber housings which are placed around the legs to prevent entrance of snow or moisture are very susceptible to tearing if damaged in any way. Any of these items which are damaged should be replaced.

5-9 When it is desired to raise the legs, the following procedure is used:

1. Remove the handhole cover PRESSURE TANK for access to the check valve.
2. Loosen the tubing connector on the leg jack side of the check valve. This will allow gas to escape as the leg is raised.
3. Raise the station so that the leg will be free.
4. Using thumb and forefinger spread the locking ring apart (See Figure 5-1) at the same time pushing it slightly toward the inside.
5. With the other hand take hold of the leg and raise it slowly. Manipulate the locking ring until the leg slips past it. The leg can then be raised to its proper position.
6. After all legs have been raised and secured with the leg hold wires, tighten the loosened connection in the pneumatic line.

5-10 Before the station can be dropped again, it will require another parachute. A new one can be used or the old one can be repacked if recovered.

5-11 PACKING PARACHUTE The necessity for care and accuracy in packing a parachute cannot be overemphasized. Carelessness, such as misplacing a stow hook or shot bag, leaving knots in the suspension lines, or dropping a suspension line while stowing in the stow loop, can cause the parachute to malfunction. Each step in the packing procedures must be carefully performed.

5-12 SHAKEOUT The purpose of the shakeout operation is to remove from the parachute all foreign matter that may have been picked up while the canopy and suspension lines were on the ground after a previous jump. The shakeout is performed either in a shakeout room indoors or in the shakeout tower outdoors. A 1/4-inch cotton rope, fitted with a metal snap fastener and run through an overhead pulley, is used to raise the parachute above the ground for the shakeout operation. A two-man team is generally used for the shakeout operation. During the following shakeout procedure, both the No. 1 man and the No. 2 man should look for any holes, rips, or snags in any component of the parachute assembly and note any such damage in order to facilitate the later formal inspection.

FIGURE 5-1 OPERATING LOCKING RING

a. The No. 1 man holds the bridle loop while the No. 2 man attaches the snap fastener to the loop.

b. The No. 2 man then pulls on the rope and raises the canopy until the skirt is raised slightly above the no. 1 man's head. The No. 2 man holds the canopy in place. The remainder of the suspension lines and the pack remain in the kit bag, which is usually used to carry the parachute.

c. The No. 1 man grasps any line at the skirt in his left hand and grasps the line to the right of the first line in his right hand. He vigorously shakes these two lines and the gore between them, making sure that all debris falls out of the gore. After looking up into the canopy to make sure that the gore is clear of debris, he passes the second line to his left hand.

d. Grasping the next consecutive line in his right hand, he repeats this shakeout process, working around the canopy until all debris has been shaken free from each gore and all the lines are in his left hand.

e. The No. 2 man then slowly raises the canopy higher, thereby pulling the suspension lines from the kit bag. At the same time the No. 1 man clears the suspension lines of foreign matter.

f. Closing the bag and putting it aside momentarily, the No. 1 man then shakes all debris from the harness and pack. He replaces the pack in the kit bag, with flaps up, and places the harness on top of the pack.

g. The No. 2 man slowly lowers the canopy while the No. 1 man coils the suspension lines onto the pack and harness.

h. When the skirt of the canopy is low enough, the No. 1 man grasps line 30 in his right hand and line 1 in his left hand and completely wraps the gore between these lines around the rest of the canopy.

i. As the No. 2 man continues to lower the canopy, the No. 1 man accordion-folds it into the kit bag, and then closes the kit bag. The parachute is now ready to be taken to the packing table for inspection and packing, or to be placed in temporary storage.

5-13 LAYOUT Open kit bag and remove parachute, placing it on packing table.

a. Grasp bridle loop and stretch parachute out the full length of table.

b. Attach bridle loop to one end of table.

c. Attach connector links to tension board at other end of table. In proper layout, the risers with 8 lines tied to each link will be on the bottom and the risers with 7 lines tied to each link will be on top.

d. Facing connector links, stand at skirt and take line 30 in left hand and line 1 in right hand and then walk toward connector links, allowing lines to slip through fingers. Then trace out lines 16 and 15 in the same manner.

e. If these lines do not trace out, determine cause by following procedures given in paragraph 5-15. If lines 30 and 1 do trace out to the top inside of the connector links, return to skirt and arrange canopy so that top center gore (No. 30) is on top.

f. Separate the two groups of lines by taking line 30 in right hand and raising hand until line 29 is raised free of the other lines. Then grasp line 29 in left hand, raising hand until line 28 is clear. Pass line 29 to right hand. Continue until all lines from 30 through 16, inclusive, are grasped in the right hand. Lines 30 through 16 are known as the right group; lines 1 through 15 are known as the left group.

g. Grasp left group in left hand. Spread the two groups of lines apart. The gore between lines 30 and 1, which is known as the top center gore, should always be on top when the parachute is laid out. The gore between lines 15 and 16, which is known as the bottom center gore, should always be on the bottom when the parachute is laid out.

5-14 DETERMINING PROPER LAYOUT If the parachute cannot be properly laid out (See paragraph 5-13), one or more faulty conditions are present in the canopy or suspension lines. These conditions must be corrected in the following order before the parachute can be laid out:

a. INVERSION An inverted canopy is one which has been completely turned inside out.

1. Cause An inverted canopy is usually caused by improper handling during recovery.
2. Identification An inversion is identified by the following conditions:
   a. V-tapes sewn to the lower lateral band are visible.
   b. Gore numbers are not readable and are to the right of their respective suspension lines, rather than to the left.
   c. Upper lateral band is turned so that suspension lines stitched at the band are not visible.
   d. Data stamped on gore 30 are not readable.
3. Remedy Trace any line from inside of lower lateral band to apex. Grasp bridle loop and pull apex down through and between any two adjacent lines.

b. TURN A turn is present in the suspension lines when one group of lines rotates completely around the other group.

1. Cause A turn is usually caused by rotation of the pack or canopy during recovery.
2. Identification A turn is identified by the fact that the suspension line groups cannot be completely separated.
3. Remedy Remove turn by rotating pack in opposite direction from turn.

c. TANGLE A tangle is the improper crossing of suspension lines between opposite groups.

1. Cause A tangle is caused when the pack tray rotates through one group of suspension lines. A tangle can occur in the air or on the ground.
2. Identification A tangle is present when it is impossible to separate the two groups of suspension lines.
3. Remedy A tangle can be removed only at the point where the suspension lines of one group encircle the other. To remove a tangle, start separating the two groups of lines at skirt and continue down lines until tangles are worked into a small group near connector links. Grasp top tangle with left hand and pull it out far enough to draw pack through loop in lines. To draw

pack through loop, reach through loop with right hand and grasping all four risers, pull the pack straight back through the tangle. Do not allow pack to turn. If there is more than one tangle, repeat above process until all tangles are removed.

d. TWIST A twist is the improper crossing of suspension lines within a respective group of lines.

1. Cause A twist is usually caused when a pack or canopy becomes turned between the two main groups of suspension lines during recovery.
2. Identification A twist is present when lines 1 and 30 cannot be checked out properly.
3. Remedy Remove a twist by rotating pack between the two main groups of suspension lines. If twists loosen, continue rotating pack until twists are removed. If twists tighten, rotate pack in opposite direction until twists are removed.

5-15 RIGGER ROLL The rigger roll is a method of preparing the unpacked parachute so that it can be stored in a neat and orderly manner until it is packed. After the parachute is properly laid out, proceed as follows:

a. Turn pack over and fold harness on top of pack.

b. Move to the skirt of the canopy. Grasping right and left groups separately, turn canopy over so that top center gore is underneath and next to table.

c. Using a fast circular motion. flip the two groups of gores up and towards each other, making two distinct rolls of the groups.

d. Replace parachute on table, and roll groups tight and close to each other.

e. Unfasten bridle loop and fold apex down to within 18 inches of skirt so that canopy is folded to about one-half its length, with the upper half lying between the two groups of rolled gores.

f. Roll parachute from folded end toward skirt, being careful to see that the roll does not exceed 14 inches in width.

g. Continue by rolling suspension lines and harness risers around the outside center, and place the completely rolled parachute on pack.

h. Place waistband over canopy and tighten at the adjuster. When canopy is rolled in this manner, the top center gore (30) is on the outside of the roll. Since the serial number of the parachute is stenciled on the top center gore, the serial number may be read without unrolling the parachute.

5-16 INSPECTING MAIN PARACHUTE All parachutes that are issued for service will be inspected thoroughly for general condition and serviceability according to SR 742-295-5. The following points will be covered in a complete repack inspection:

a. Pack and Deployment Bag Carefully observe condition of pack and deployment bag, watching for any defects or deterioration, or for any stains likely to cause deterioration of contents of pack. Look particularly for damaged stitching, for rusted or defective snaps or other defective hardware, and for tears or frays around mouth of bag. Since the deployment bag is made of one thickness of duck, any oil or acid on the bag might very easily soak through to the canopy.

b. Canopy With the left group of gores lying on top of the right group, begin at skirt and carefully check fabric of uppermost gore, especially in the pressure area, looking for line burns, holes, tears, stains, adhering foreign matter, and loose or broken stitching. When one gore has been thoroughly inspected, flip it over and inspect the next gore. Continue above procedure until all gores have been inspected. Never test condition of fabric by attempting to tear it; pulling vigorously enough to test the fabric will twist the weave and weaken the nylon.

c. Suspension Lines Beginning at point of attachment of lines to skirt, inspect each suspension line for snags and frays. See that there are no knots or splices in lines. Look particularly for rust where line is attached to connector link and for damaged or broken zigzag stitching at connector links and skirt. Check apex lines for similar defects.

d. Harness Inspect harness webbing for fraying, cuts, oil or acid stains, and loose or broken stitching. Check harness hardware for rust, excessive dirt, and rough spots, and for proper operation. The harness release assembly must be inspected thoroughly by inserting strap lugs into the assembly, locking the assembly, and then releasing the strap lugs again. The operation of the release assembly should be smooth and decisive. If there is any doubt about the proper functioning of the release assembly, the assembly should be replaced.

5-17 FOLDING GORES After inspection has been completed, lay out parachute as described in paragraph 5-13. Be sure that enough tension is applied to parachute so that lines will snap against table if pulled up and released. Then proceed as follows:

a. Move to skirt of canopy and separate the two groups of gores. Reach under right group of suspension lines and grasp left group with right hand. With left hand, flip right group of lines over left group of lines, at the same time pulling left group over to right side of table. Release both groups of lines.

b. With right hand pick up line 16 (top line in right group), and hold it slightly to right of table with thumb and forefinger, with V-tape down.

c. Pick up line 17 with left hand and hold this line up so that entire gore between lines 16 and 17 is extended.

d. Bring left hand down to right hand in a semicircular snapping motion so that air within gore will be forced out, moving gore to right and allowing it to settle in a folded position along right edge of table.

e. Place line 17 directly on top of line 16, and hold both lines with thumb and forefinger of right hand. With left hand, pick up line 18 and fold gore as in (d) above. Continue folding gores until line 30 is held in right hand.

f. Now take folded group of lines 16 through 30 between thumb and forefinger of left hand and place them between middle and index fingers of right hand, turning lines a quarter-turn clockwise so that right group of lines is parallel to table with line 30 to the right. Bring right hand down to edge of table.

g. Next fold gores 1 through 15, placing their respective lines between right thumb and index finger. These gores are folded as in (a) through (f) above, except for the last gore.

h. After line 14 is placed on top of line 13, take line 15 and raise it straight up, crooking left elbow inside left side of raised skirt. Blow down inside the canopy so that gores 14 and 15 are blossomed. Lower line 15 on top of line 14 so that the two gores are separated. Gore 14 now lies to the right and gore 15 to the left.

i. Holding lines tight in right hand, pull lines out to side until folded gores slide off table at right.

j. Taking the line separator, base up and toward apex, slide it over the two groups of lines so that base extends over V-tapes.

k. Holding line separator tight against folded gores with left hand, slide right hand up along canopy about one arm's length. Grasp channel (folded edge), pull canopy off table, and ease it back on table in order to smooth the bottom gore. After parachute is eased back onto table, gore 14 will be on left and gore 15 on right.

l. Now place line separator base down on table. Check skirt of canopy. The V-tapes of the right group should be turned down, and the tapes of the left group turned up.

m. Place a shot bag over the lines where they are held by the separator.

n. Flip left group of gores over to left side of table, and dress the two bottom gores. To dress gores, start at skirt of canopy and pull with fingers, using equal pressure along edge of skirt.

o. Returning to skirt, dress remaining gores. The dressed edges of the folded gores will not present a straight line appearance, because of the shape of the T-10 canopy. The canopy is slightly wider about 2 feet above the lower lateral band than it is at the band.

p. Dress the skirt of canopy by turning folded gores up toward the channel at a 45-degree angle and laying them out flat again, pulling gently at each gore during the procedure.

q. Count gores, starting at bottom gore, to make sure that there are 15 gores in each group. Be sure gore 30 is on top of left group and gore 15 is on bottom of right group. Check to see that channel is clear of canopy fabric. If channel is not clear, correct by dressing canopy gore in area where fabric appears to be in channel. If channel cannot be cleared by above method, refold canopy. After a final check, the canopy is ready for the long fold.

5-18 LONG FOLD Grasp corner of right group of gores. resting right hand on edge of folded gores about 8 inches from skirt. Fold gore corners back so that skirts of these gores are parallel to channel. Repeat above procedures with left group of gores.

a. Moving along canopy toward apex, continue folding right group of gores across channel. Place shot bags at intervals along canopy to hold folded gores.

FIGURE 5-2. PACKING PARACHUTE

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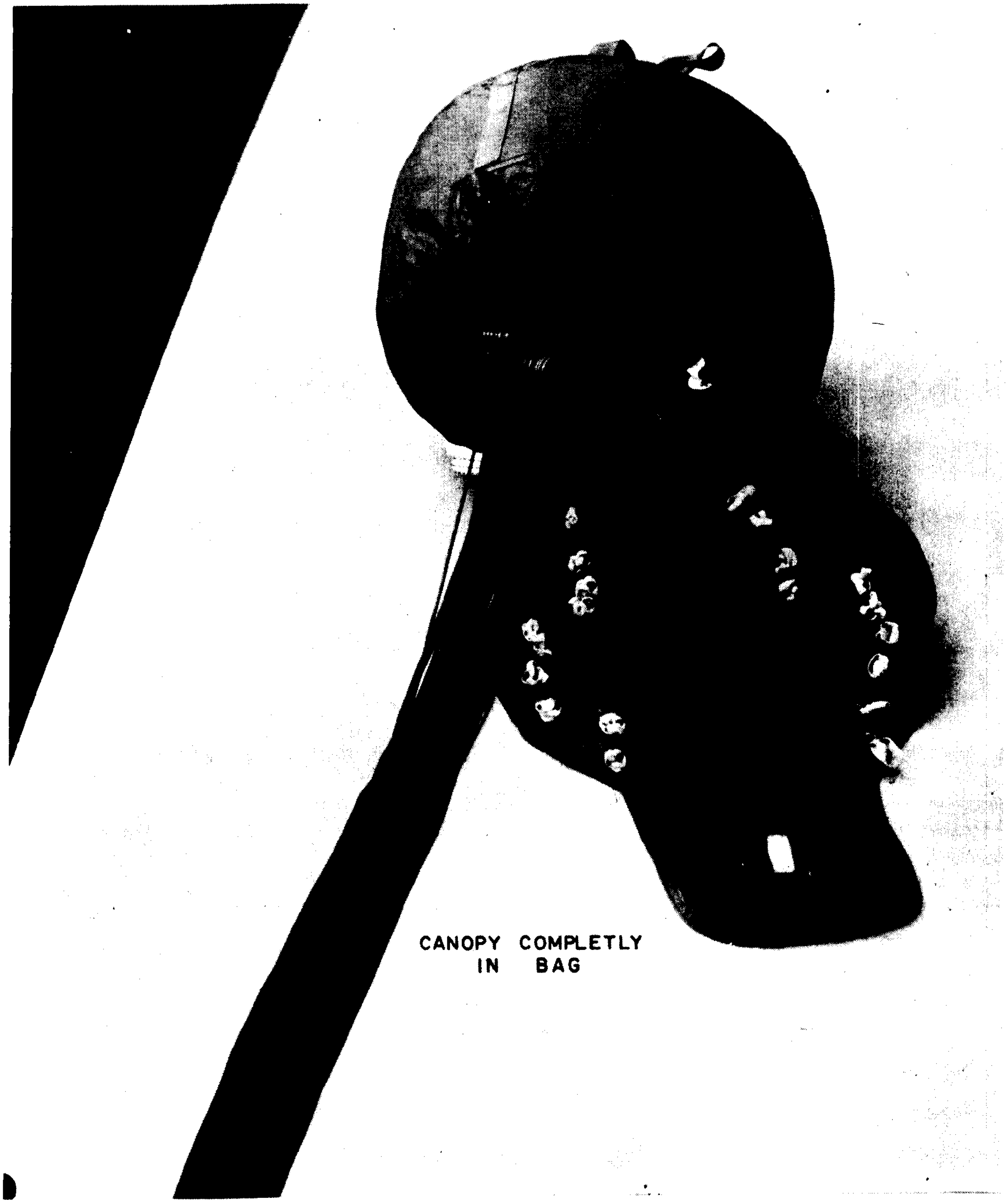

FIGURE 5-3. PACKING PARACHUTE

STOWING LINES

FIGURE 5-4. PACKING PARACHUTE

FIGURE 5-5. PACKING PARACHUTE

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FIGURE 5-6. PACKING PARACHUTE

FIGURE 5-7. PACKING PARACHUTE

b. Repeat procedure in (a) above with left group of gores until canopy has been completely folded. Canopy should be folded to within 48 inches of the apex, the folds tapering from 10 inches wide at the skirt to 6 inches wide near the apex.

5-19 STOWING CANOPY Stow the canopy in deployment bag (See Figures 5-2, 5-3, 5-4, 5-5, 5-6, and 5-7)

a. Continue stowing canopy alternately from left to right in a zig-zag fashion, making each fold the width of the bag.

b. When canopy skirt nears mouth of bag, neat stowing becomes difficult. Therefore, grasp suspension lines and push remainder of canopy into bag so that lines come straight out of mouth of bag.

NOTE:

A parachute rigger kit is furnished.

5-20 CALIBRATION AND ALIGNMENT Automatic Weather Transmitting Set AN/GMT-1(XG-1) was given a final calibration and alignment prior to shipping. No adjustment should be necessary except transmitter tuning (See Section II paragraph 2-13)

5-21 If, during a practice transmission test (paragraph 5-6), any transmitted characters are incorrectly spaced, erratic in any manner, or are missing entirely, the coding mechanism should be examined.

CAUTION

The rebalance potentiometer R201 and code selector switches S-204 and S-205 should not be tampered with unless absolutely necessary.

5-22 The brushes contacting code wheel S-203 and sequencing switch S-201 should be examined to see that they extend equal distances beyond the brush holders and that they have enough tension to make contact with the wheel segments. If they do not extend equal distances beyond the brush holders, characters may be run together erroneously. If they do not maintain contact with the code wheel, characters may be missing entirely. If the contact groove of the wheel is dirty or corroded, the brush may make intermittent contact as the wheel revolves. This will result in the erratic characters.

5-23 CODING MECHANISM ALIGNMENT For access to the code selection mechanism, the lid, front cover plate, rear cover plate, and gear cover may be removed. Care must be taken not to break any wired connections. (See Figures 5-8 and 5-9)

5-24 Care must be taken to always turn the wheels in the proper direction to avoid damage to the brushes.

5-25 All brushes should be straight and extend equal length beyond the brush holder. A simple method of adjusting the relative position of the wheels is to loosen the set screws of the external gears on sequencing switch shaft and drive motor B-202 shaft. This will permit rotation of the code wheel by holding the sequencing switch stationary. These wheels should be aligned so that the sequencing switch applies voltages to the bridge amplifier and A.C. bridge circuit for rebalancing just after the longest code letters B and V have left the third set of brushes.

5-26 To adjust the switch operating cam, loosen the set screws in the cam and rotate it to a position so that S-202 opens just after the code wheel sends the first call letter code group. All set screws should be tightened after completion of this alignment.

5-27 In the upper code selector mechanism, selector switches S-204 and S-205 must be aligned with each other, with the mechanical stop, and with the rebalance potentiometer R-201. If the high speed selector switch S-205 is out of alignment with the stop, loosen the set screws in this arm, turn the large gear clockwise as viewed in Figure 4-5 until the pin touches the spring stop. Holding it in this position, turn the lower switch arm until it is connected with the letter M.

NOTE:

To ascertain if the arm is contacting a particular letter or letters, several methods can be used. A visual or ohmmeter check is the easiest method. If main switch S-101 is ON with the test unit connected to J-105 with the timer by-pass switch ON and S-207 on the coding mechanism in the CALIB position, the equipment will be energized but will remain stopped in that part of the transmission cycle in which S-207 was changed from the OPERATE to CALIB position. A calibrating unit connected to J-302 will indicate by means of lights which characters would be sent if the equipment was operating.

5-28 Tighten set screws in the lower arm then turn the large gear counter-clockwise until it touches the stop in the opposite direction. The lower switch arm should then be contacting the letter D. Then, tighten the set screws in this arm and loosen those in the large gear. Starting with the large gear in the last position, turn it clockwise approximately 24 degrees until the lower arm S-205 is equally on the U and N buttons forming the letter M. Holding it in this position, turn the upper switch arm S-204 until it is just changing from I to A. This occurs when the contact arm first touches the T button. This position should be determined very accurately by electrical means. Then, tighten set screws in the large gear. The two selector switches should now be aligned with each other and with the mechanical stop. As a check rotate the large gear clockwise stopping at each crossover point to be sure that they occur in the correct place. A cross-over point is that point at which switch S-204 changes contact to form a different letter. This should occur when the lower contact arm of S-205 is about midway in a letter. (See the Code Letter Versus Resistance Table for the crossover points.) If these crossover points do not occur properly, it may mean that the upper contact arm is deflected to the wrong radius. Bending this arm to the proper radius of 0.555 inches from the center of the shaft should correct this difficulty.

5-29 The next step is the positioning of the rebalance potentiometer R-201. To accomplish this it is convenient to have the bridge amplifier and rebalancing circuits in operation with the calibrate variable resistance, such as the decade box, connected in place of the weather element transducer. This is accomplished by removing P-202 and P-402 and connecting the variable resistance between J-402 and ground. These adjustments should be made in an ambient temperature of 70°F and the bridge should not be operated over 5 minutes at a time without allowing the resistance to cool. Final check should be made if the system has set idle for approximately one hour. Manually turn the large gear until the code selector switches S-204 and S-205 contact the letters I and V, for instance. These letters should indicate a resistance shown on the Code Letter Versus Resistance Table provided. Disconnect P-403 and connect the ohmmeter to this plug. Loosen the mounting nuts on the potentiometer R-201 and rotate it until the ohmmeter reads 225 plus the value shown on the Code Letter Versus Resistance Table for this point. Partially tighten one mounting nut and connect P-403 to J-403 removing the ohmmeter. The system should then be put into operation using a suitable meter. Set the decade resistance box to the required resistance and rotate potentiometer R-201 slightly until the contact arm of S-205 is centered on the contact V. Then tighten securely the mounting nuts on R-201. The positioning of R-201 should now be correct.

5-30 The code mechanism alignment should now be checked by comparing code letter versus resistance for adherence to the Code Letter Versus Resistance Table furnished for that particular coding unit and bridge amplifier.

5-31 CIRCUIT AND COMPONENT TROUBLE SHOOTING Use schematic Figure 7-1 for circuit tracing.

5-32 The Test Set furnished (See Figure 5-16) can be used to measure:

1. Battery voltage
2. B+
3. Bridge Amplifier plate current
4. Transmitter oscillator plate current plus power amplifier screen grid current.
5. Transmitter power amplifier plate current.

5-33 Other circuit tracing, resistance readings, and voltage readings, can be made using a conventional multimeter TS-352/U, Simpson 260, Weston 790, or equal; or a Vacuum Tube Voltmeter TS-375/U, Radio City 662, or equal. Figures 5-8 through 5-15 should be consulted for component locations.

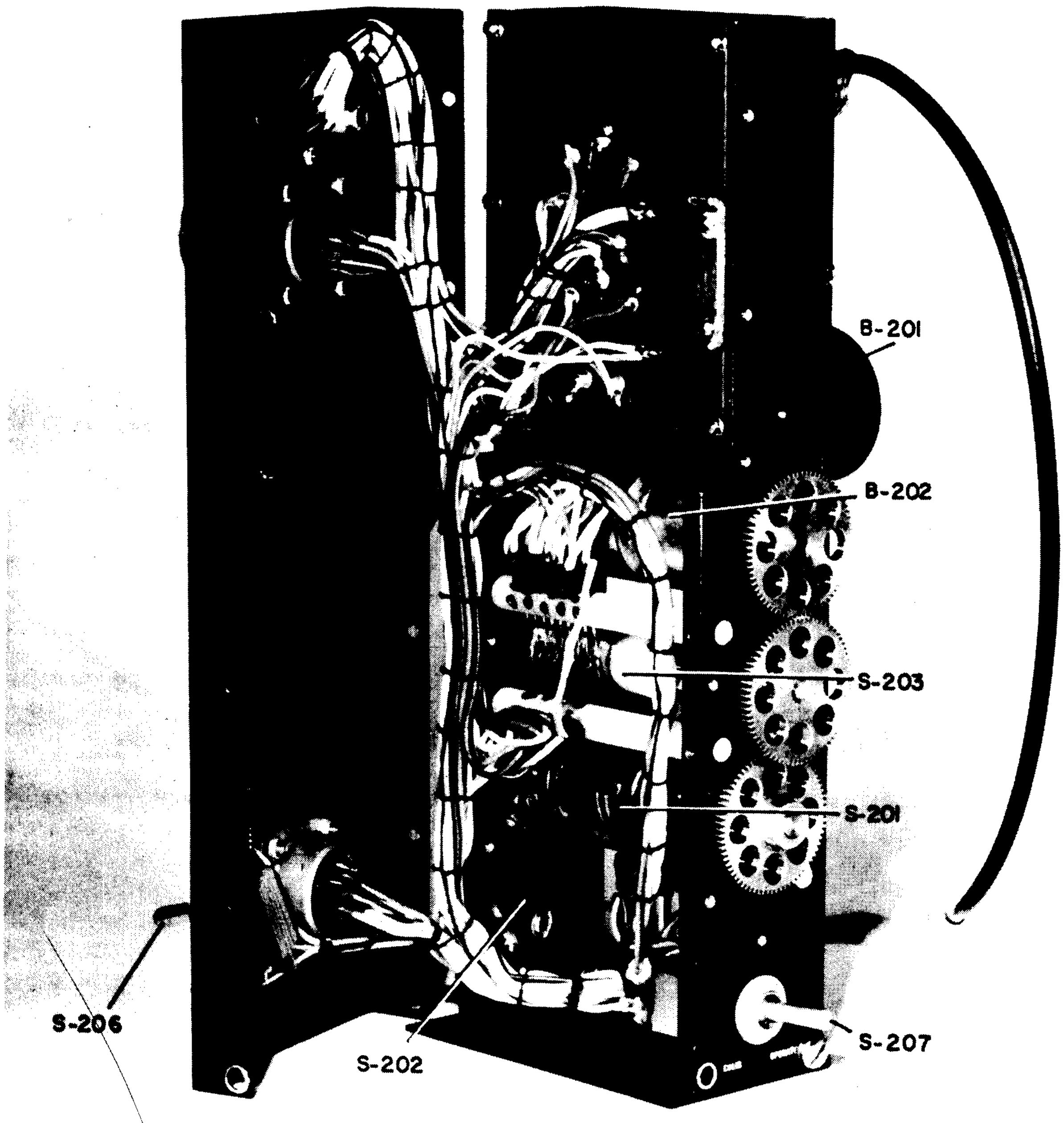

FIGURE 5-8 COMPONENT LOCATIONS
CODING MECHANISM

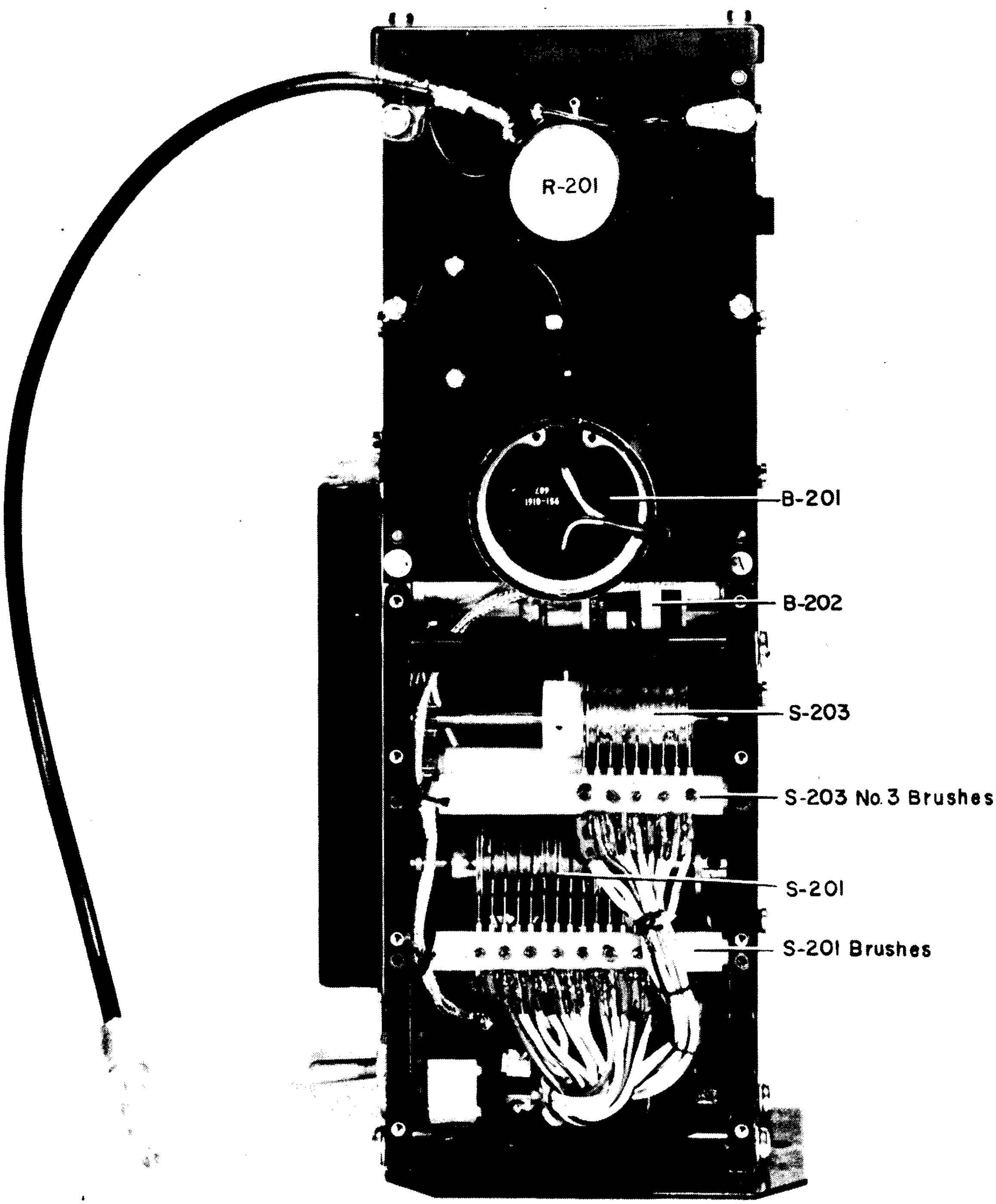

FIGURE 5-9. COMPONENT LOCATIONS
CODING MECHANISM

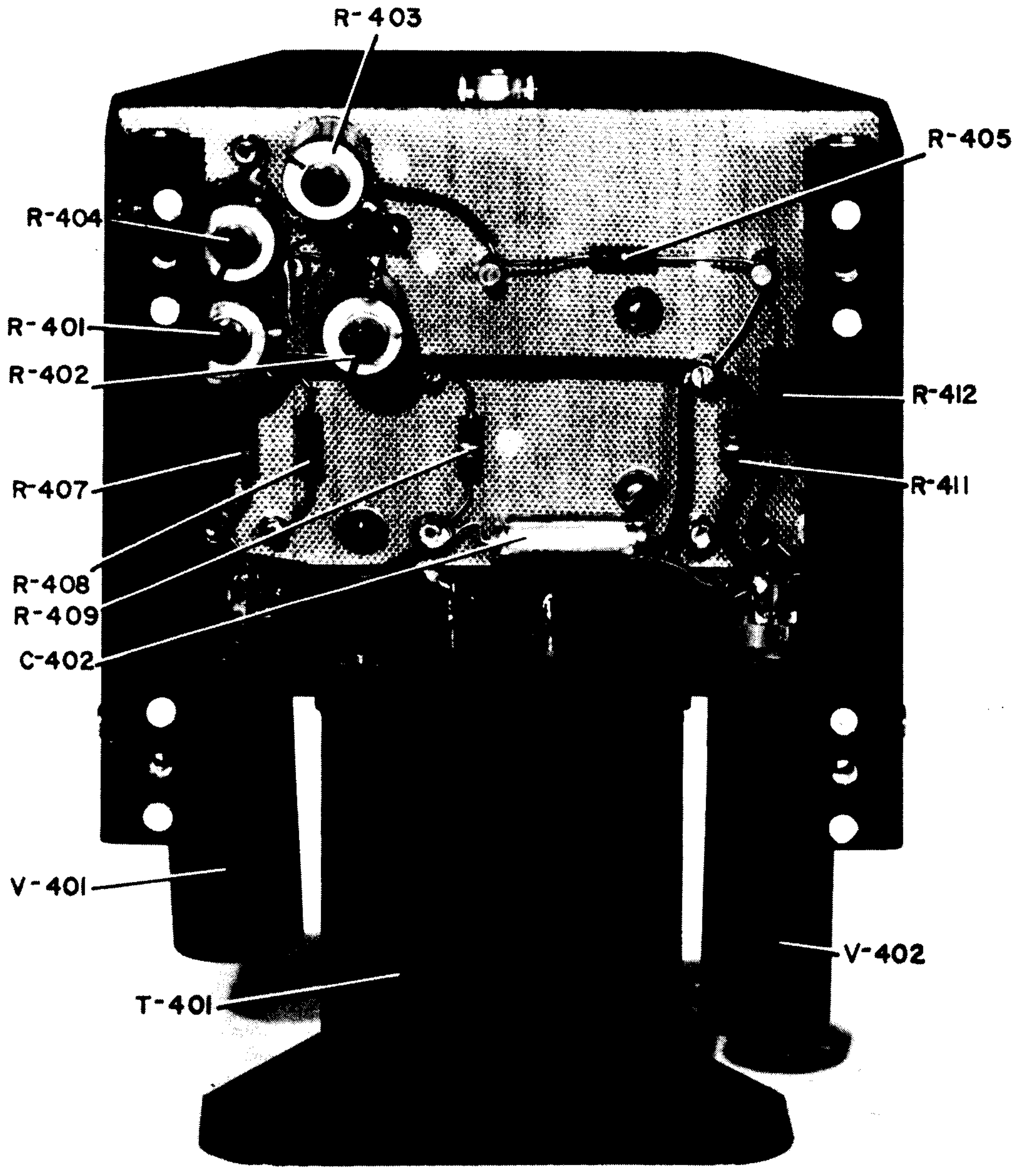

FIGURE 5-10 COMPONENT LOCATIONS
BRIDGE AMPLIFIER

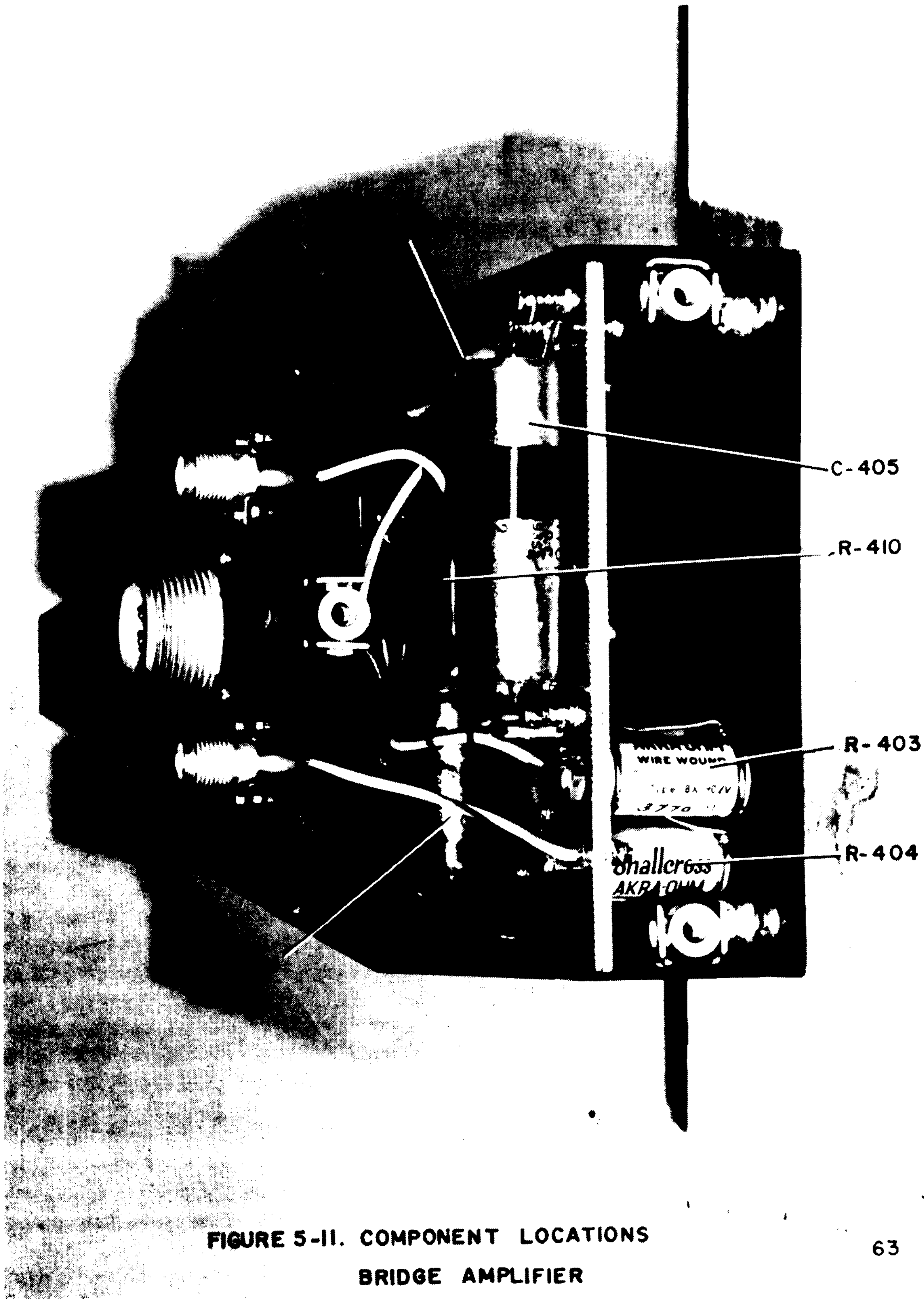

FIGURE 5-11. COMPONENT LOCATIONS
BRIDGE AMPLIFIER

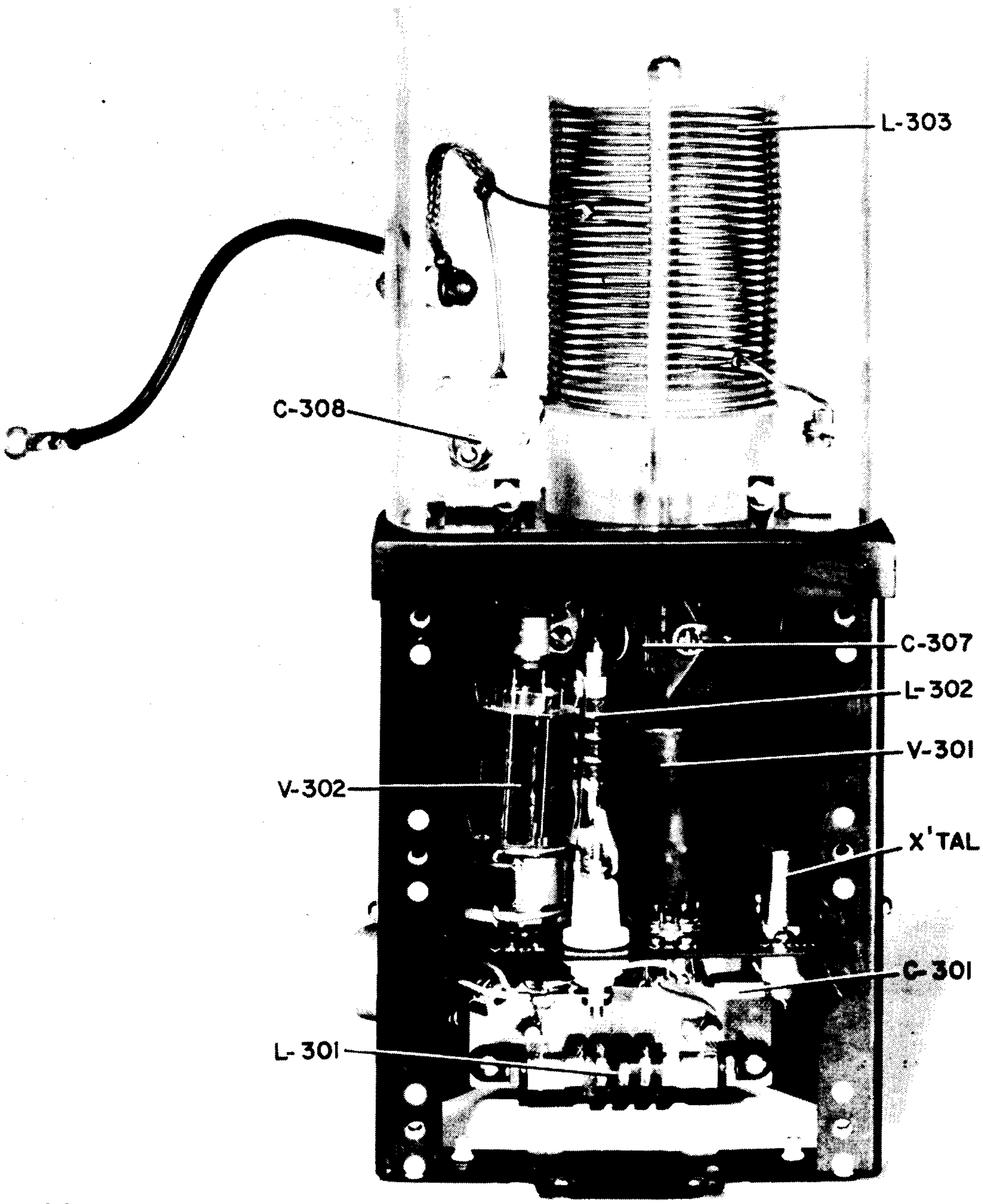

FIGURE 5-12 COMPONENT LOCATIONS

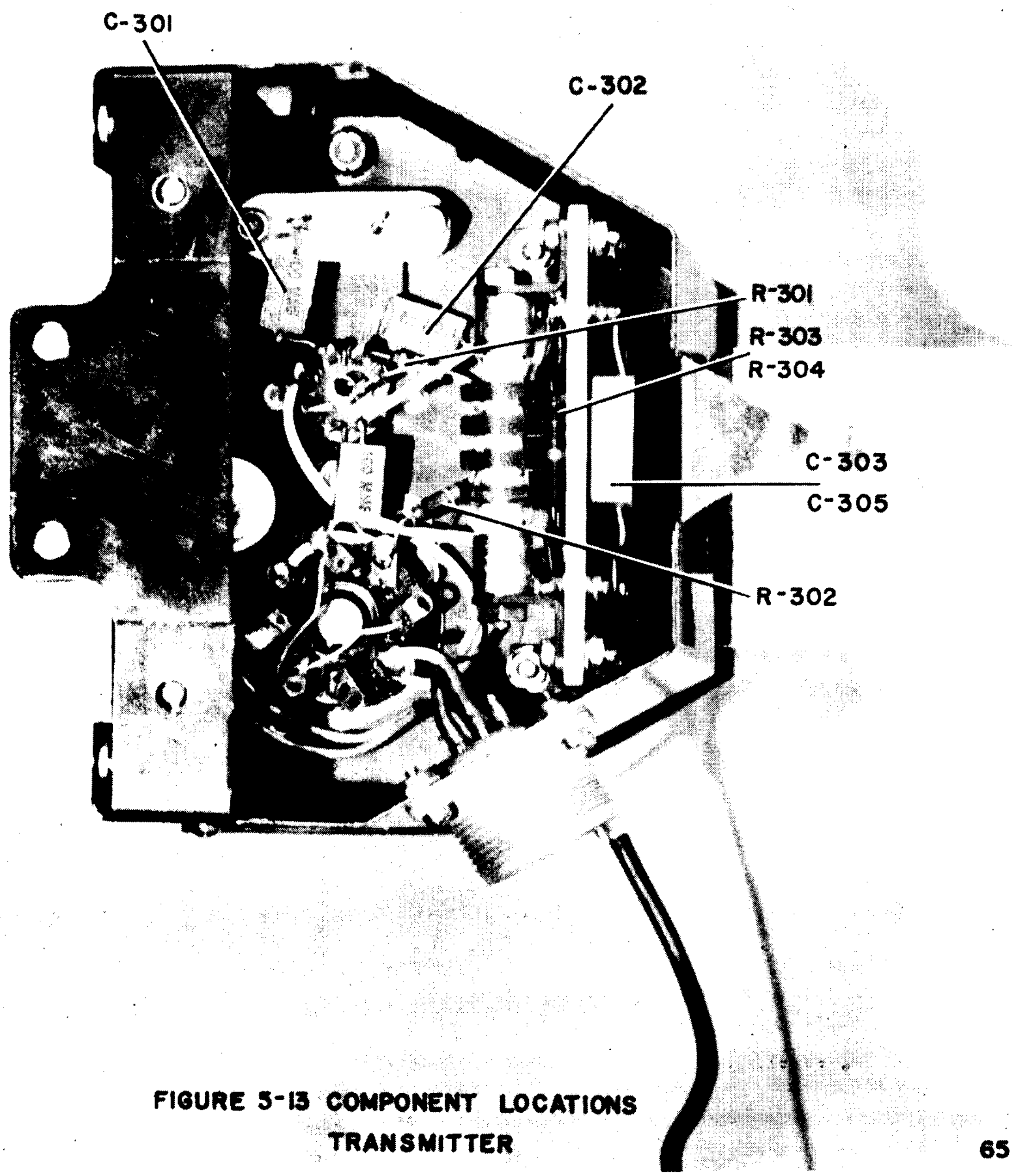

FIGURE 5-13 COMPONENT LOCATIONS
TRANSMITTER

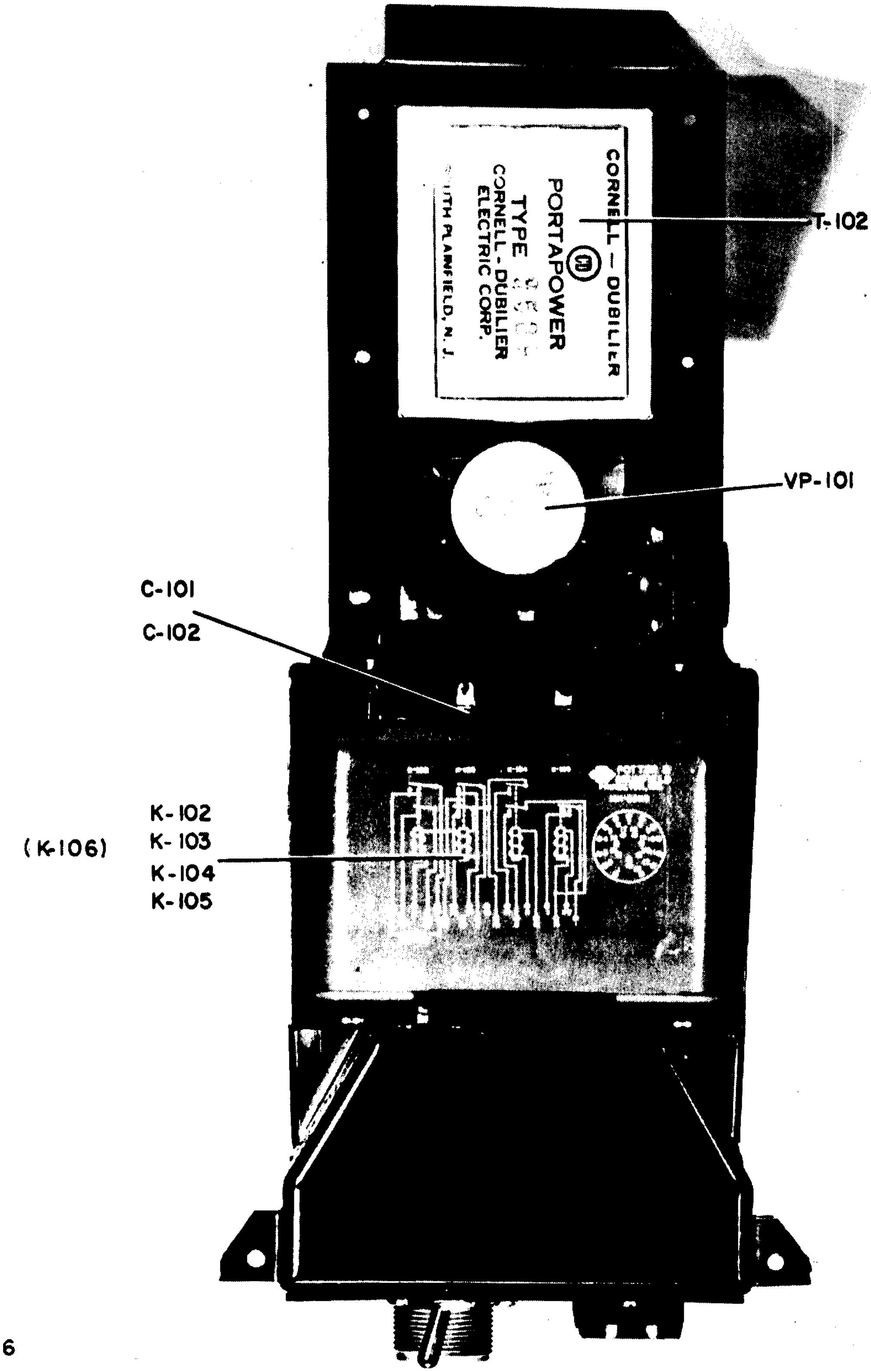

FIGURE 5-14 COMPONENT LOCATIONS
POWER SUPPLY

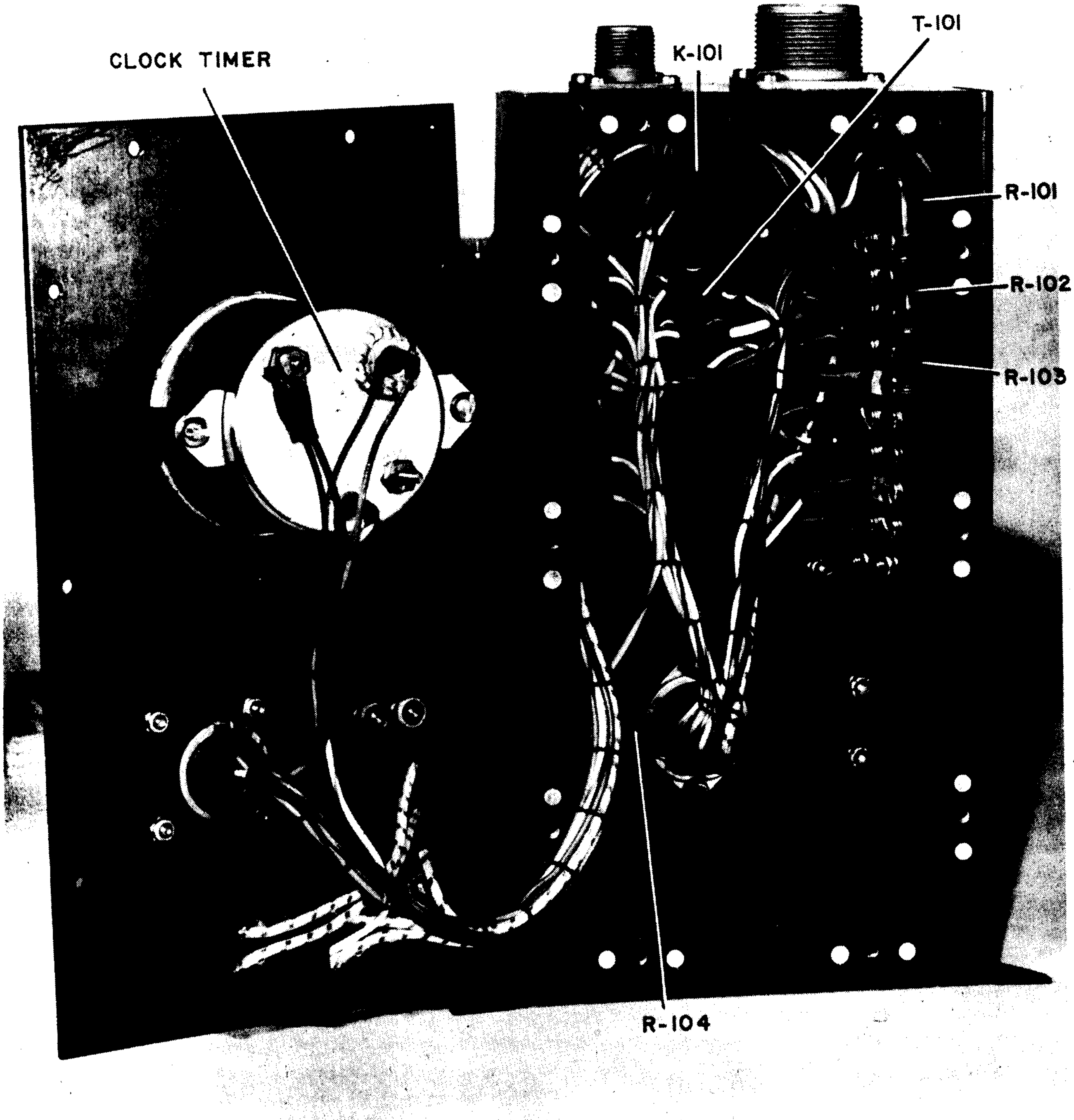

FIGURE 5-15. COMPONENT LOCATIONS

POWER SUPPLY

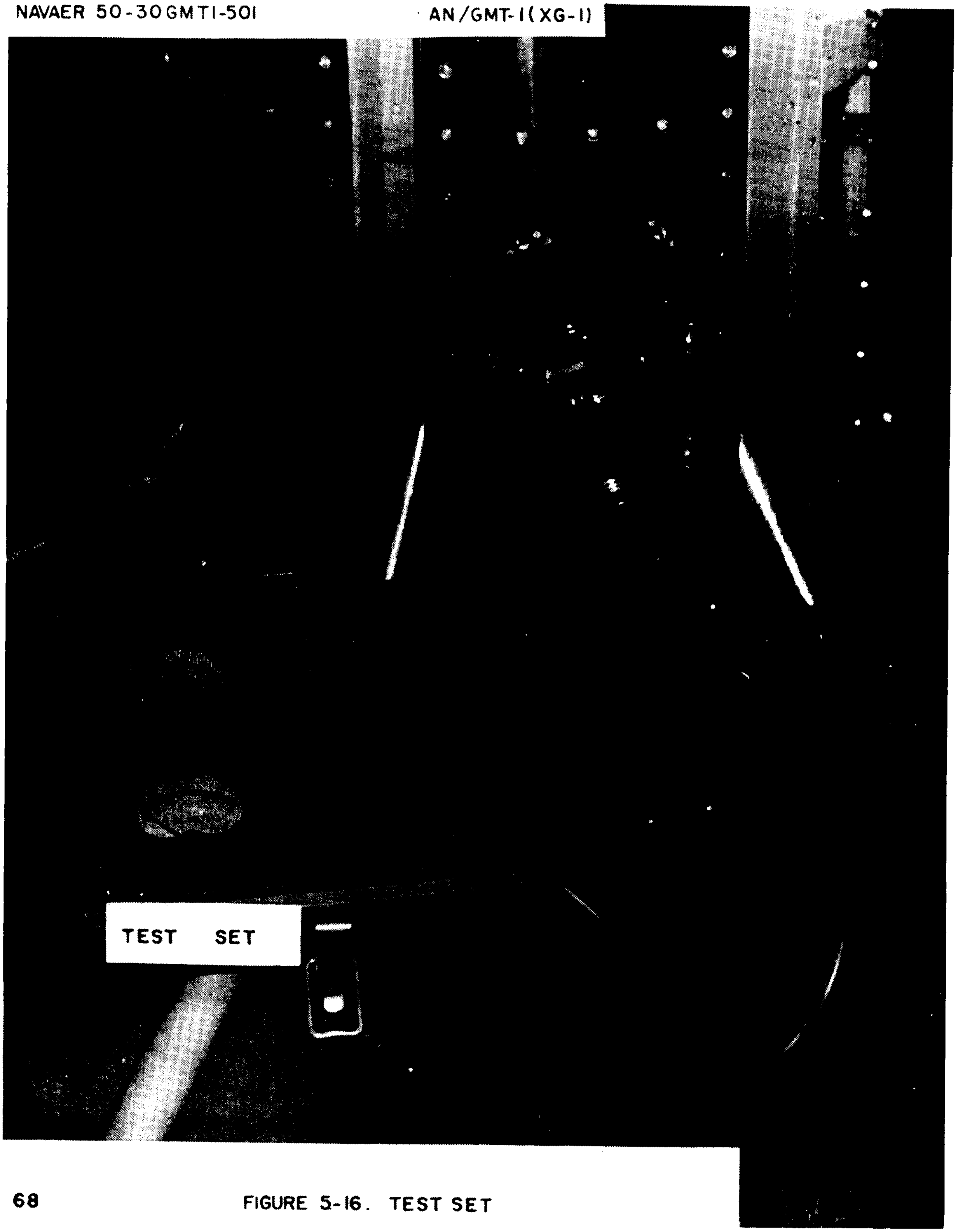

FIGURE 5-16. TEST SET

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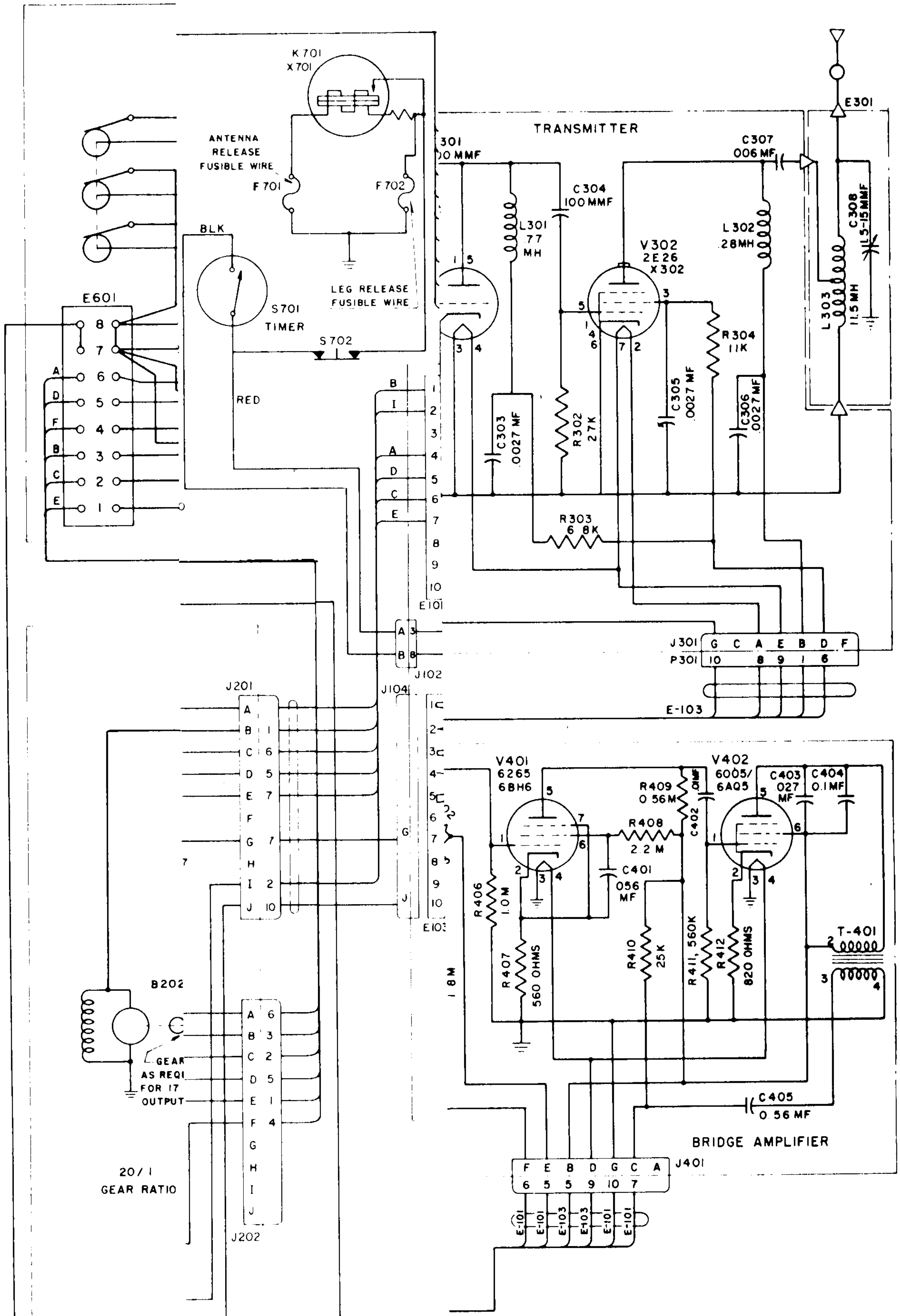
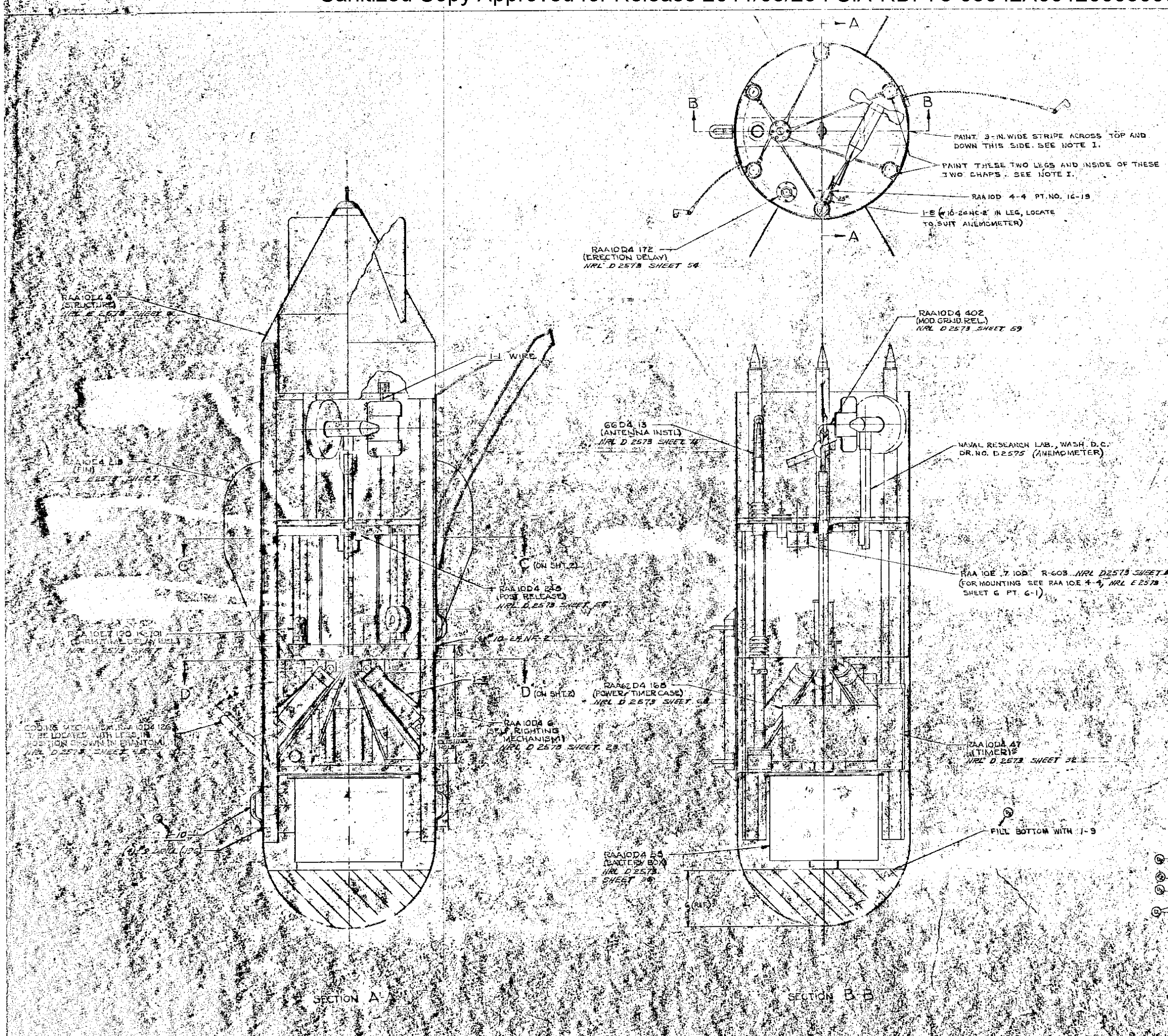
5-34 CALIBRATING UNIT A Calibrating Unit, Automatic Weather Transmitting Set, AN/GMT-1(XG-1) is furnished with the equipment, including a cable to connect it to J-302 on the coding mechanism. It is used only if and when a unit requires alignment. When the calibrating unit is connected to J-302, and S-207 is switched to CALIB with the equipment turned on, B-202 will cease to operate and the lights on the calibrating unit will indicate which code letters would be transmitted. The equipment can be operated to any other position in its cycle of operation from the calibrating unit. S-200 on this calibrating unit will operate K-103 to rebalance the bridge during alignment.



IGURE 7-1. SCHEMATIC, AUTOMATIC WEATHER TRANSMITTING SET AN/GMT-1(X6-1)



REVISIONS			
SYM	DESCRIPTION	DATE	APPROVED
B	CHANGED DWG. NO. RAA10D4 168 TO RAA62D4 168	12-7-5[illegible]	
D	REVISED SHEETS 1 AND 2 TO AGREE WITH CHANGES ON ENTIRE WEATHER STATION (D1) ADDED PTS. 1-7 & 1-8 (D2) ADDED D 2575 (ANEMOMETER) (D3) FOAMED POLYSTYRENE 1-9 REPLACES 10"-DIA. PLASTIC BALL		
E1	WEIGHT ADDED	3-22-56	J.C.R.
E2	HANDLES PT. 1-10 ADDED	3-22-56	J.C.R.

NOTE I (ENAMEL FLUORESCENT PAINT SYSTEM)
1. ANODIZE OR ALODIZE ALL ALUMINUM PRIOR TO PAINTING.
2. APPLY 1-COAT OF WASH PRIMER MIL-C-15328 (APPLY TO ½ MIL. THICKNESS).
3. APPLY 1-COAT OF ZINC CHROMATE PRIMER MIL-P-6889 (APPLY TO ABOUT .8 TO 1 MIL. THICKNESS).
4. APPLY 1-COAT OF HIGH QUALITY WHITE ALKYD RESIN ENAMEL MIL-E-1115A (APPLY TO ABOUT 1 MIL. THICKNESS).
5. APPLY 2-COATS OF ENAMEL-TYPE FLUORESCENT PAINT (FIRE ORANGE) (APPLY ABOUT 2½ MIL TOTAL THICKNESS, 1.2 TO 1.3 MIL PER COAT) THIS FORMULA TO BE SPECIFIED BY N.R.L.
6. COVER PAINT WITH PAPER WHILE STATION IS IN STORAGE.

NOTE II
1. ASSEMBLE IN ERECTING AND SHIPPING JIG (N.R.L. DR. NO. 2573 SHEET 80) STORE AND SHIP IN UPRIGHT POSITION.
2. ALWAYS CHARGE BATTERY RAA10D 4-55, PT. 1-5, IN UPRIGHT POSITION.

NOTE III
FILL SELF-RIGHTING MECH. RAA10D 4-6 WITH NITROGEN OR HELIUM ONLY.

(E1) WEIGHT
COMPLETE ASSEMBLY APPROX. 220 LBS.

	RAA10E7100R606	RESISTOR			
	RAA10E7100R603	RESISTOR			
	RAA10E7100K101	RELAY			
1	RAA10ET 100	WIRING DIAGRAM			
1	RAA66D4 13	ANTENNA INSTL.			
1	RAA24DT 147	CUT-OFF SWITCH INSTL.	(SHT. 2)		
1	RAA10D4 402	MOD. GRND. RELEASE			
1	RAA10D4 277	THERMOMETER	(SHT. 2)		
1	RAA10D4 248	POST RELEASE			
1	RAA10D4 172	ERECT. DELAY MECH.			
1	RAA62D4 168	POWER & TIMER CASE			
1	RAA10D4 126	CODING MECHANISM	(SHT. 2)		
1	RAA10D4 114	TRANSMITTER CHASSIS	(SHT. 2)		
1	RAA10D4 109	BRIDGE AMPL. CHASSIS	(SHT. 2)		
1	RAA10D4 55	BATTERY BOX			
1	RAA10D4 47	TIMER			
1	RAA10D4 6	SELF RIGHTING MECH.			
4	RAA10E4 215	FIN			
1	RAA10E4 4	STRUCTURE			
1	N.R.L. DR. NO. D2575	ANEMOMETER			
4	1-10	HANDLE No. UH-2A	ALUM.	BUD RADIO	
1	1-9	FOAMED POLYSTYRENE 3-5 LBS./CU.FT.		[illegible] CANTON, MASS.	
1	1-8	RD. HD. SCREW #10-24 × ½	STEEL		
1	1-7	WHITE NEOPRENE DANNER BALLOON TYPE U #30		DEWEY AND ALMY [illegible] CAMBRIDGE, MASS.	
1	1-5	WASHER AN936A6			
1	1-4	NUT AN316-6R			
1	1-3	SHIMS AN315-6-28			

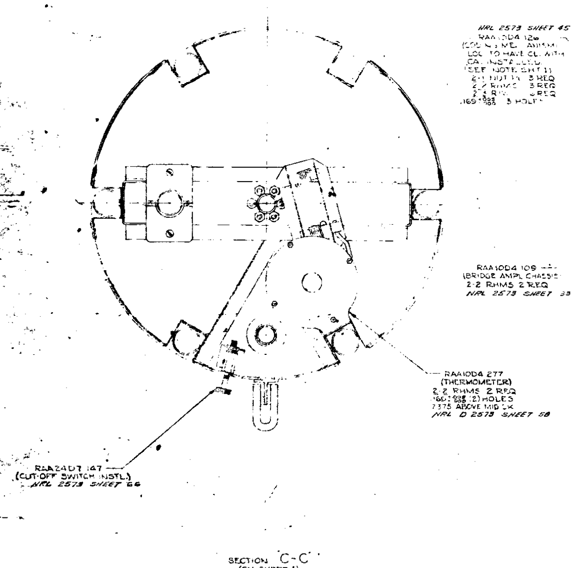
LIST OF MATERIAL

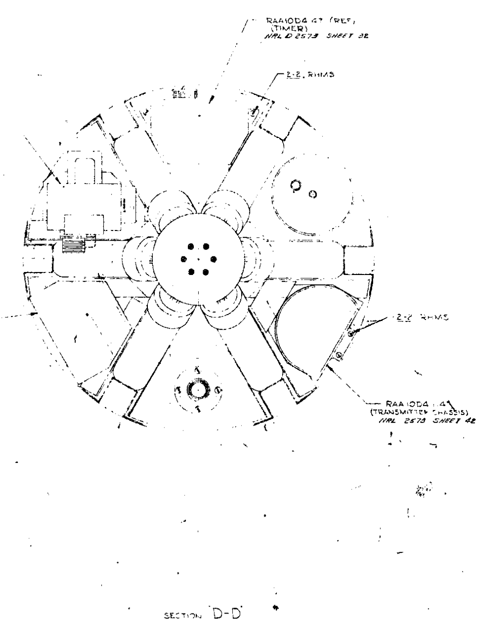
AUTOMATIC WEATHER STATION
ASSEMBLY
AN/GMT-1 (XC-1)

U.S. NAVY [illegible]

RAA10E4 250

REVISIONS			
	DESCRIPTION	DATE	APPROVED
D	SHEET BROUGHT UP TO DATE		





FIND	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	UNIT WT
6	2-3	RIV. AN426AD3			
11	2-2	RHMS AN515-8-6			
8	2-1	NUT PL AN366F832			

LIST OF MATERIAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES

ON FRACTIONS

ON DECIMALS

ON ANGLES

R.K. LOGAR

SEPT. 1950

AUTOMATIC WEATHER STATION

ASSEMBLY

AN/GMT-1 (XG-1)

SCALE 1/2

U. S. NAVY ELECTRONICS LABORATORY

SAN DIEGO 52, CALIFORNIA

RAA10E4 230

SHEET 2 OF 2 ALT D

RESTRICTED

SHEET 2 OF ... NRL ... E 2573

	Revision
D	ADDED REF. TO [illegible] ON SH. [illegible]
D	REVISED TO AGREE WITH CHANGES IN DESIGN
D1	ADDED NOTE

1	Y-300	CRYSTAL [illegible] KC	SEE NOTE #1 ON SH. 1
1	Y-101	SOCKET [illegible] WITH TUBE CLAMP, [illegible] #1617B	(OR EQUIV)
1	X-[illegible]	SOCKET TUBE CERAMIC [illegible] TBRS-4	(OR EQUIV)
1	X-402	SOCKET, TUBE MIN. [illegible] SHIELD BASE & SHIELD-EBY #102M	(OR EQUIV)
1	X-401	SOCKET TUBE MIN. 7 PIN [illegible] SHIELD BASE, SHIELD-EBY #102M	(OR EQUIV)
	X-302	SOCKET TUBE OCTAL CERAMIC [illegible] E-O-9-T	(OR EQUIV)
1	X-301	SOCKET TUBE MIN. 7 PIN [illegible] BASE & SHIELD [illegible]	(OR EQUIV)
	X-300	SOCKET, CRYSTAL [illegible] EBY #2R-7	(OR EQUIV)
1	W-701	CABLE	RAA-10 D 7 149
1	W-501	CABLE, BOUND TEST LEAD [illegible] DWG# 8896	(OR EQUIV)
1	W-108	CABLE	RAA-10D-7-149
1	W-107	CABLE	RAA-10D-7-149
1	W-106	CABLE, AMPHENOL RG 58/U	(OR EQUIV)
1	W-105	CABLE, AMPHENOL RG 58/U	(OR EQUIV)
	W-104	CABLE	RAA 10 D 7 149
	W-103	CABLE	RAA 10 D 7 149
	W-102	CABLE	RAA 10 D 7 149
1	W-101	CABLE	RAA 10 D 7 149
1	VP-101	VIBRAPACK MALLORY TYPE GP-G556	SEE NOTE 9 ON SH 1
1	V-402	TUBE, MIN. 7 PIN GLASS	6AQ5
1	V-401	TUBE MIN. 7 PIN, GLASS	6 BH 6
1	V-302	TUBE, OCTAL, GLASS	2 E26
1	V-301	TUBE, MIN. 7 PIN, GLASS	[illegible]
1	T-401	TRANSFORMER, OUTPUT [illegible]	NEL SPEC. # [illegible]
1	T-101	TRANSFORMER, POWER, [illegible] 115V SEC.	NEL SPEC. #3102

LIST OF MATERIAL (CONT.)

1	S-102	SWITCH PUSHBUTTON, [illegible] TYPE SW1270	(OR EQUIV)
1	S-10	MARK TIME TIMER	RAA 10 D 4 172
1	S-502	SWITCH, TOGGLE, SPST, BALL HANDLE	
1	S-501	SWITCH, [illegible] MALLORY #[illegible]	(OR EQUIV)
1	S-207	SWITCH, TOGGLE, DPDT	12 V.
1	S-206	SWITCH [illegible] BALL HANDLE	
1	S-205	SWITCH CODE SELECTOR	SPECIAL RAA [illegible] SH 4
1	S-204	SWITCH CODE SELECTOR	SPECIAL RAA [illegible] SH 4
1	S-203	SWITCH, [illegible] WHEEL	SPECIAL RAA [illegible] 9-3
1	S-202	MICROSWITCH BZ-2RL-2	RAA 10 D 4 [illegible] SH 1
1	S-201	SWITCH, SEQUENCING [illegible]	RAA [illegible] D 4 26 SH # 2
1	S-102	CLOCK ASSEMBLY	RAA 10 D 4 47 SH 1 SEE NOTE #11 ON RAA 10 E 7 100 SH 1
1	S-101	SWITCH, TOGGLE, DPST [illegible] SW 1269	(OR EQUIV)
1	R-606	RESISTOR, PRECISION	SEE NOTE #2 ON SH 1
1	R-605	PRESSURE TRANSDUCER LOW RANGE	0-2000 OHMS SEE NOTE #8 ON SH #1
1	R-604	TEMPERATURE TRANSDUCER	0-2000 OHMS RAA 10 [illegible] 4 277
1	R-603	PRESSURE TRANSDUCER HIGH RANGE	0-2000 OHMS SEE NOTE #8 ON SH #1
1	R-602	WIND SPEED TRANSDUCER	0-2000 OHMS
1	R-601	DIRECTION TRANSDUCER	0-2000 OHMS

SEE N.R.L. DR. NO. D2575

1	R-412	RESISTOR, FIXED, [illegible]	ALLEN-BRADLEY (OR EQUIV.)
1	R-411	RESISTOR FIXED, [illegible] W .56 Meg	ALLEN-BRADLEY (OR EQUIV)
1	R-410	RESISTOR FIXED W.W. 10W, 25K	ALLEN-BRADLEY (OR EQUIV)
1	R-409	RESISTOR [illegible] W .56 Meg	ALLEN-BRADLEY (OR EQUIV)
1	R-408	RESISTOR, FIXED, ½ W, [illegible] Meg	ALLEN-BRADLEY (OR EQUIV)
1	R-407	RESISTOR, FIXED, ½ W, 500 OHMS	ALLEN-BRADLEY (OR EQUIV)
1	R-406	RESISTOR, FIXED, [illegible] W 1.2 Meg	ALLEN-BRADLEY (OR EQUIV)
1	R-405	RESISTOR, FIXED, ½ W, [illegible] Meg	ALLEN-BRADLEY (OR EQUIV)
1	R-404	RESISTOR, PRECISION 3.545 K	SEE NOTE #6 ON SH 1
1	R-403	RESISTOR, PRECISION, 3.775 K	SEE NOTE #5 ON SH 1
1	R-402	RESISTOR, PRECISION, 10 K	SEE NOTE #4 ON SH 1
1	R-401	RESISTOR, PRECISION, 10K	SEE NOTE #4 ON SH 1
1	R-304	RESISTOR, FIXED, [illegible] W, 11 K	ALLEN-BRADLEY (OR EQUIV)
1	R-303	RESISTOR, FIXED, 2 W, 68 K	ALLEN-BRADLEY (OR EQUIV.)
1	R-302	RESISTOR, FIXED, ½ W, 27 K	ALLEN-BRADLEY (OR EQUIV)
1	R-301	RESISTOR, FIXED, ½ W [illegible] K	ALLEN-BRADLEY (OR EQUIV)
1	R-201	POTENTIOMETER [illegible]	SEE NOTE #[illegible] ON SH 1
1	R-103	RESISTOR [illegible] OHMS	SEE NOTE #3 ON SH 1
1	R-102	RESISTOR [illegible]	SEE NOTE #3 ON SH 1
1	R-101	RESISTOR [illegible]	SEE NOTE #3 ON SH 1
1	P-403	PLUG - AMPHENOL UG 88/U	(OR EQUIV)
1	P-402	PLUG - AMPHENOL UG 88/U	(OR EQUIV)
1	P-401	PLUG - AMPHENOL [illegible]	RAA 10 D 7 149
1	P-301	PLUG - AMPHENOL [illegible]	RAA 10 D 7 149
1	P-202	PLUG - AMPHENOL [illegible]	RAA 10 D 7 49
1	P-201	PLUG - AMPHENOL [illegible]	RAA 10 D 7 49
1	P-105	PLUG AMPHENOL [illegible] MODIFIED	RAA 10 [illegible] 49
1	P-104	CONNECTOR, [illegible] #75-[illegible]	(OR EQUIV)
1	P-103	CONNECTOR, [illegible]	(OR EQUIV)
1	P-102	PLUG - AMPHENOL AN 3[illegible] 10SL-4S	(OR EQUIV)
1	P-101	PLUG - AMPHENOL 79-04 M	(OR EQUIV)
1	M-503	METER 0-1.5 ma DC WESTON MOD 301 3"	(OR EQUIV)
1	M-502	METER 0-15 VDC WESTON MOD 301 3"	(OR EQUIV)
1	M-301	METER 0-500 ma DC WESTON MOD 301 3"	(OR EQUIV)
1	L-303	INDUCTOR, [illegible] #12 SOLID WIRE SPACED DIA. OF WIRE ON 2" DIA. FORM, TAP AT 3, 4, 5 & 6 TURNS FROM BOTTOM - 1.5 μh	
1	L-302	INDUCTOR - 3 PIE-WOUND, [illegible] 120 ma, 2.8 μh, NEL SPEC. #3118A	
1	L-301	INDUCTOR - 4 PIE WOUND, [illegible] 75 ma, 77 μh, NEL SPEC. #3117	
1	K-301	RELAY [illegible] SEC. DELAY EDISON MOD 501, SPST [illegible] NORMALLY OPEN, HEATER VOLTAGE 12 V.	(OR EQUIV)
	K-106	RELAY UNIT - HERMETICALLY SEALED RAA [illegible] #2	
	K-101	RELAY [illegible] EDISON [illegible] SPST, CONTACTS 5 A NORMALLY OPEN, HEATER VOLTAGE 12 V.	(OR EQUIV)
	J-403	RECEPTACLE AMPHENOL UG-87/U	(OR EQUIV)
	J-402	RECEPTACLE AMPHENOL UG 87/U	(OR EQUIV)
1	J-401	RECEPTACLE AMPHENOL AN [illegible] A-[illegible] 5-1P	(OR EQUIV)

LIST OF MATERIAL (CONT.)

NOTE:
FOR ANEMOMETER ELECTRICAL COMPONENTS SEE N.R.L. DR. NO. D2575

1	J-302	RECEPTACLE - AMPHENOL AN 3102 A-22-14P	(OR EQUAL)
1	J-301	RECEPTACLE - AMPHENOL AN 3102A-16S-1P	(OR EQUIV)
1	J-202	RECEPTACLE - AMPHENOL AN 3102-18-1P	(OR EQUIV)
1	J-201	RECEPTACLE - AMPHENOL AN 3102-18-1P	(OR EQUIV)
1	J-105	RECEPTACLE - AMPHENOL AN 3102A-18-1S	(OR EQUIV)
1	J-104	PLUG - OCTAL	RAA-10A-7-70 (OR EQUIV)
1	J-103	PLUG - OCTAL	RAA-10A 7 73 (OR EQUIV)
1	J-102	RECEPTACLE - AMPHENOL AN 3102-10SL-[illegible]	(OR EQUIV)
1	J-101	RECEPTACLE - AMPHENOL 79 PC 4 F	(OR EQUIV)
1	F-702	FUSIBLE WIRE .010	RAA 10 D 4 [illegible] SH 5
	F-701	FUSIBLE WIRE .010	RAA 10 D 4 [illegible] SH 5
1	E-601	BLOCK TERMINAL, BARRIER TYPE, JONES #141-B	(OR EQUIV)
1	E-303	INSULATOR, FEED THRU - E. F. JOHNSON #135-44	(OR EQUIV)
1	E-302	INSULATOR, FEED THRU - E. F. JOHNSON #135-44	(OR EQUIV)
	E-301	INSULATOR, FEED THRU - E.F. JOHNSON #135-44	(OR EQUIV)
1	E-102	BLOCK TERMINAL, BARRIER TYPE, JONES #3-142-Y	(OR EQUIV)
1	E-101	RESISTOR BOARD, FRANKLIN, 1½" 26 TERMINALS	(OR EQUIV)
	C-405	CAPACITOR, FIXED, PAPER, TUBULAR 400V. .5 μf	(OR EQUIV)
1	C-404	CAPACITOR, FIXED, PAPER, TUBULAR 400 V. .1 μf	(OR EQUIV)
1	C-403	CAPACITOR, FIXED, PAPER, TUBULAR 400 V. .025 μf	(OR EQUIV)
1	C-402	CAPACITOR, FIXED, PAPER, TUBULAR 400 V. .01 μf	(OR EQUIV)
1	C-401	CAPACITOR, FIXED, MICA, 400 V. .06 μf	(OR EQUIV)
	C-308	CAPACITOR, VARIABLE, AIR-TRIMMER, CARDWELL ZR-15-AS 1.5-15 μμf	(OR EQUIV)
	C-307	CAPACITOR, FIXED, MICA, [illegible] V. .006 μf	(OR EQUIV)
1	C-306	CAPACITOR, FIXED, SILVER-MICA, 600 V. .002 μf	(OR EQUIV)
1	C-305	CAPACITOR, FIXED, SILVER-MICA, 600 V. .002 μf	(OR EQUIV)
1	C-304	CAPACITOR, FIXED, SILVER-MICA, 600 V. .005 μf	(OR EQUIV)
1	C-303	CAPACITOR, FIXED, SILVER-MICA, 600 V. [illegible]	(OR EQUIV)
1	C-302	CAPACITOR, FIXED, SILVER-MICA, 600 V. [illegible]	(OR EQUIV)
1	C-301	CAPACITOR, FIXED, MICA, 500 V. .00[illegible]	(OR EQUIV)
1	C-102	CAPACITOR - SEE NOTE #10 ON SHEET 1	
1	C-101	CAPACITOR - SEE NOTE #10 ON SHEET 1	
1	BT-101	STORAGE BATTERY	SEE RAA 10 D 4 55
1	B-[illegible]	MOTOR-GLOBE MOTO-MITE TYPE MMD-[illegible] (OR EQUIV)	SEE NOTE #13 ON SH 1
1	B-201	MOTOR-KOLLSMAN TYPE #351-0161 (OR EQUIV)	SEE NOTE #2 ON SH. 1

LIST OF MATERIAL

AN/SMT-1 (XN-1) AUTOMATIC WEATHER STATION

ELECTRONICS PARTS LIST

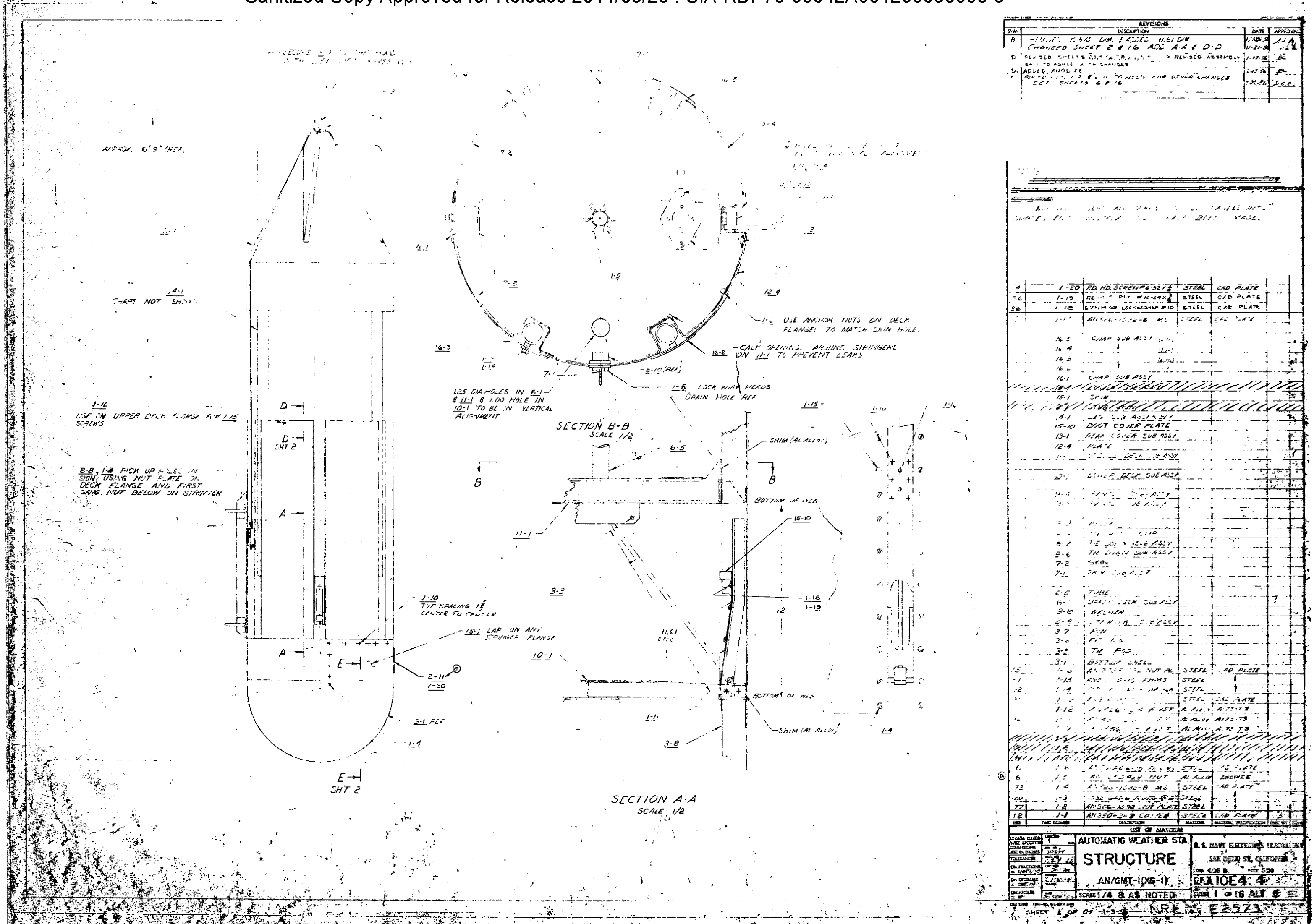
U. S. NAVY ELECTRONICS LABORATORY SAN DIEGO 52, CALIFORNIA

RAA 10 E 7 100

SHEET 3 ALT. D

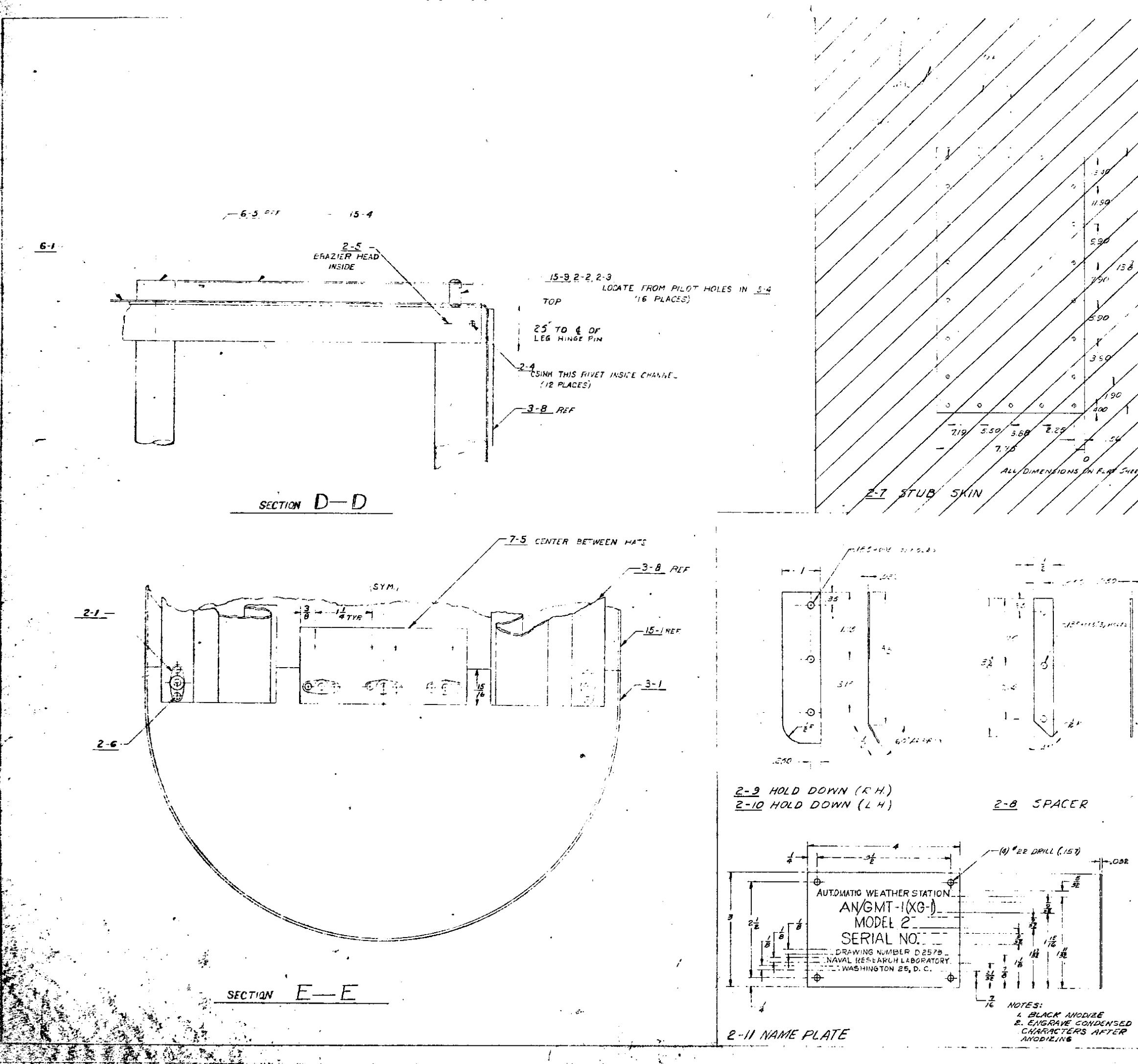
SHEET 5 OF 81 1-3-56

N.R.L. DWG. NO. E 2573


REVISIONS
APPROX. 6'9" REF.
SECTION B-B
SCALE 1/2
SECTION A-A
SCALE 1/2
USE ANCHOR NUTS ON DECK FLANGES TO MATCH DRAIN HOLE.
LOCK WIRE HEADS
DRAIN HOLE REF
.125 DIA HOLES IN 6-1 & 11-1 & 1.00 HOLE IN 10-1 TO BE IN VERTICAL ALIGNMENT
USE ON UPPER DECK FLANGE FOR 1-15 SCREWS
SHIM (AL ALLOY)
BOTTOM OF WEB
LAP ON ANY STRINGER FLANGE
TYP SPACING 1 1/2 CENTER TO CENTER
SHT 2
1-1 AN380-3-2 COTTER STEEL CAD PLATE
1-2 AN366-1032 NUT PLATE STEEL
LIST OF MATERIAL
AUTOMATIC WEATHER STA.
STRUCTURE
AN/GMT-1(XG-1)
U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
SCALE 1/4 & AS NOTED
IOE4 4
1 OF 16
NRL E2573

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
B	REDRAWN & REMOVED ½ DIM & ADDED .25 DIM ON SECT D-D	9-5-56	A.E.H.
D	DELETED PT. 2-7	1-27-56	
D1	ADDED ANODIZE	2-15-56	
[illegible]	ADDED PT. 2-11	3-12-56	



LIST OF MATERIAL

REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	FINISH
1	2-11	NAME PLATE	AL. ALLOY	6061-T6	BL. ANODIZE
1	2-10	HOLD DOWN	AL. ALLOY	24S-T3	ANODIZE
1	2-9	HOLD DOWN	AL. ALLOY	24S-T3	ANODIZE
2	2-8	SPACER	AL. ALLOY	24S-T3	ANODIZE
~~2~~	~~2-7~~	~~STUB SKIN~~	~~AL. ALLOY~~	~~24S-T3~~	
	15-5	SPACER			
	15-4	SUN SHIELD			
	7-5	CLIP			
	6-5	TUBE			
	6-	UPPER DECK SUB-ASSY			
	3-8	STRINGER SUB-ASSY			
	3-1	BOTTOM SHELL			
	2-6	AN 426-AD3 RIVET			
	2-5	AN 456-AD4 RIVET			
	2-4	AN 426-AD4 RIVET			
32	2-3	#8 LOCK WASHER	STL.	CD. PL.	
32	2-2	AN 515-6-4 RHMS.	STL.	CD. PL.	
30	2-1	AN 366 F1032 NUT PL.	STL.	CD. PL.	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
ON FRACTIONS ± 1/32
ON DECIMALS ± .010
ON ANGLES ± ½°

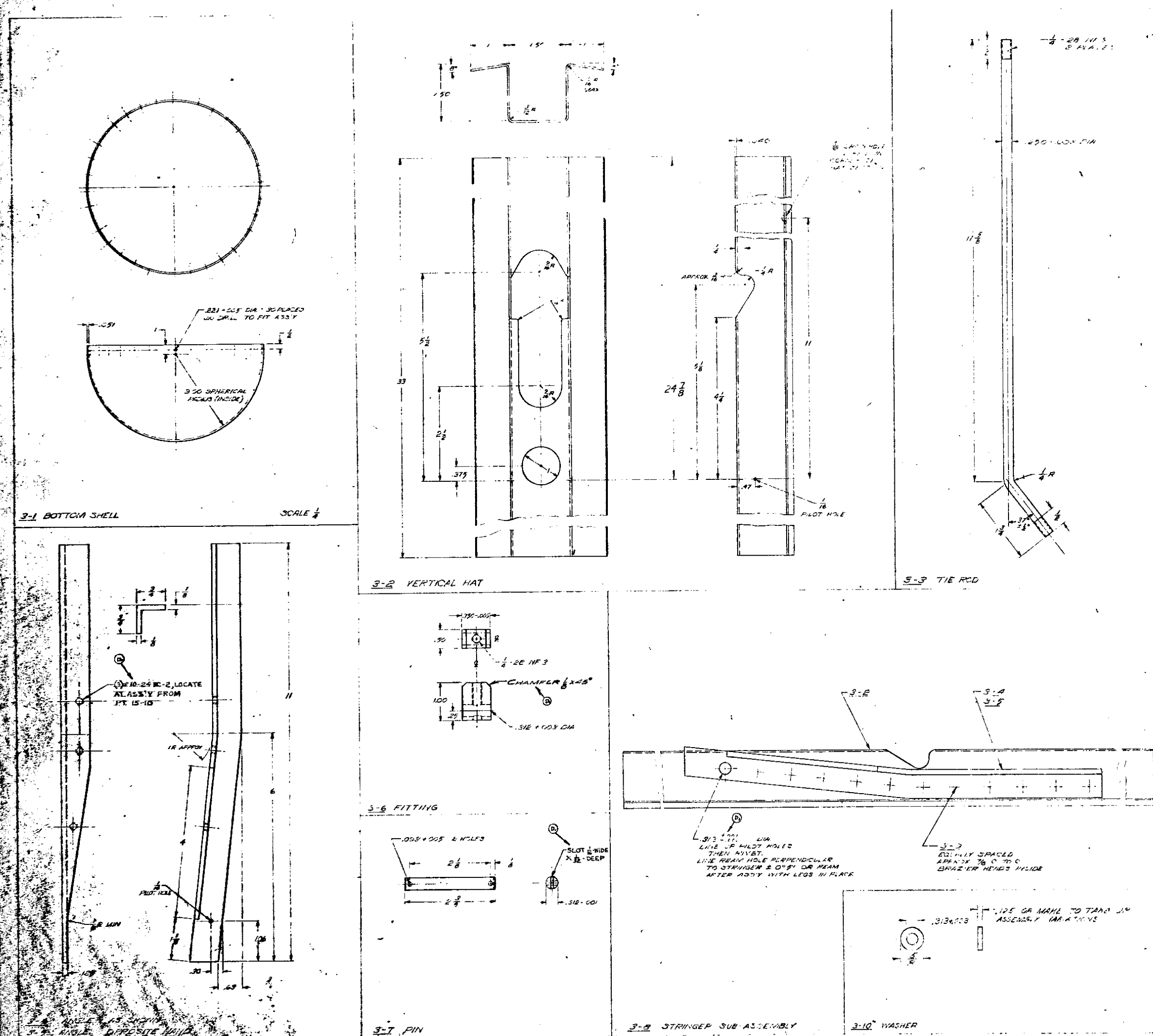
AUTOMATIC WEATHER STA.
STRUCTURE
AN/GMT-1(XG-1)

SCALE 1/1

U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
CODE 4380
RAA10E4 4
SHEET 2 OF 16 ALT E

SHEET 2 OF 81 NRL DWG. NO. E2573

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
D1	PT. 3-4 & 3-5 ADDED #10-24 HOLES		
D1	PT. 3-7 ADDED SLOT		
D1	PT. 3-8 .3137 +.001/-.000 WAS .3125 +.0010	1-27-56	JE
C1	PT. 3-6 ADDED CHAMFER		
D2	STAINLESS STEEL WAS ALUM. ALLOY		
D3	ADDED ANODIZE	2-15-56	JE



NOTES:
1. PART NO. 3-2: HEAT TREAT AFTER FORMING TO T-4 CONDITION.
2. PART NO. 3-4 & 3-5: MAKE FROM EXTRUSION

REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	FINISH
12	3-10	WASHER	AL ALLOY	24S-T4	ANODIZE
132	3-9	AN435 AD4 RIVET	AL ALLOY	A17S-T3	
6	3-8	STRINGER SUB-ASS'Y			
6	3-7	PIN	[illegible]	[illegible]	
6	3-6	FITTING	AL ALLOY	24S-T4	ANODIZE
6	3-5	ANGLE			
6	3-4	ANGLE			
6	3-3	TIE ROD		24S-T4	
6	3-2	VERTICAL HAT		24S-O	
1	3-1	BOTTOM SHELL	AL ALLOY	52S-O	ANODIZE

LIST OF MATERIAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS ± 1/64 1/32
ON DECIMALS ± .005 .010
ON ANGLES ± 1/2°

AUTOMATIC WEATHER STA.

STRUCTURE

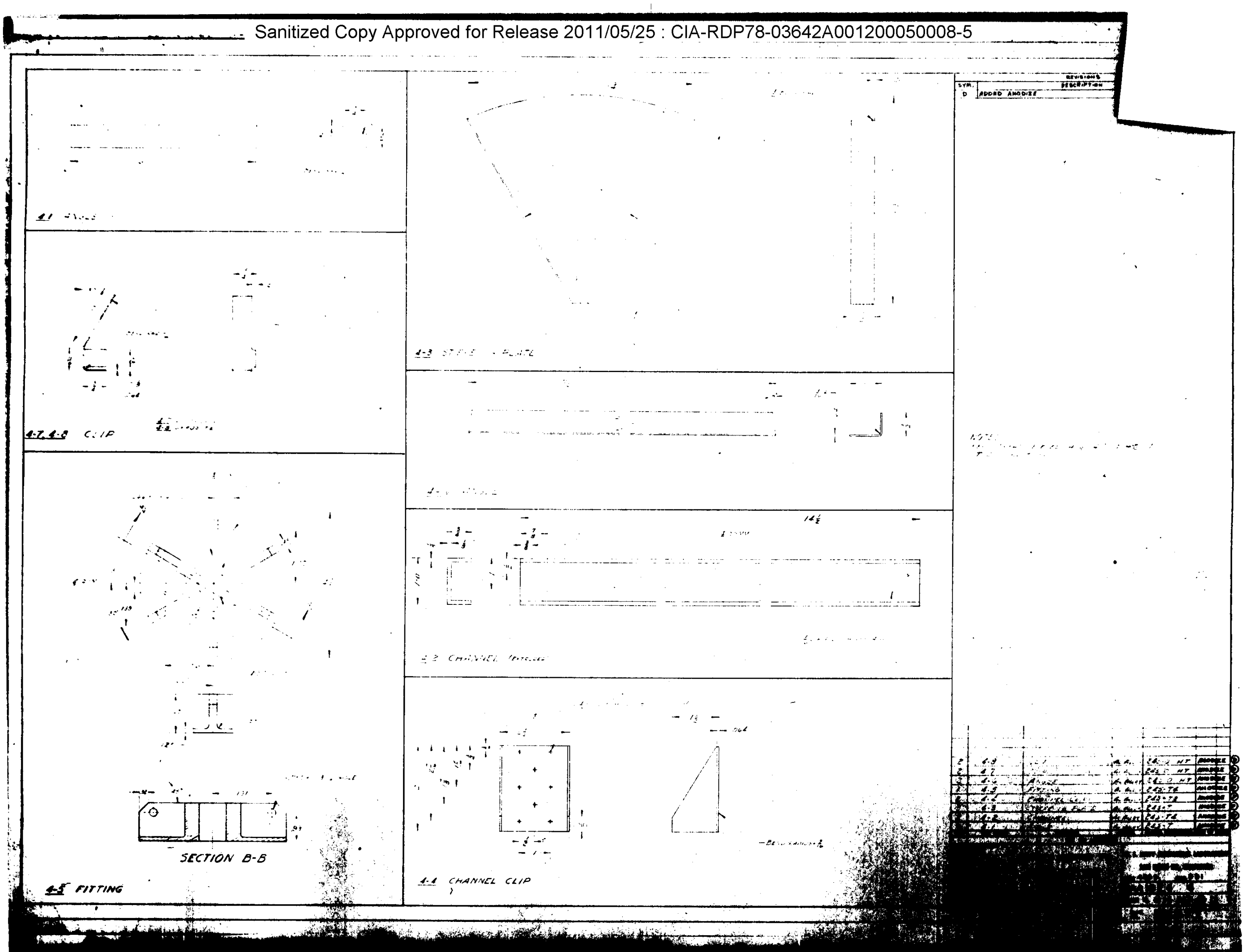
AN/GMT-1(XG-1)

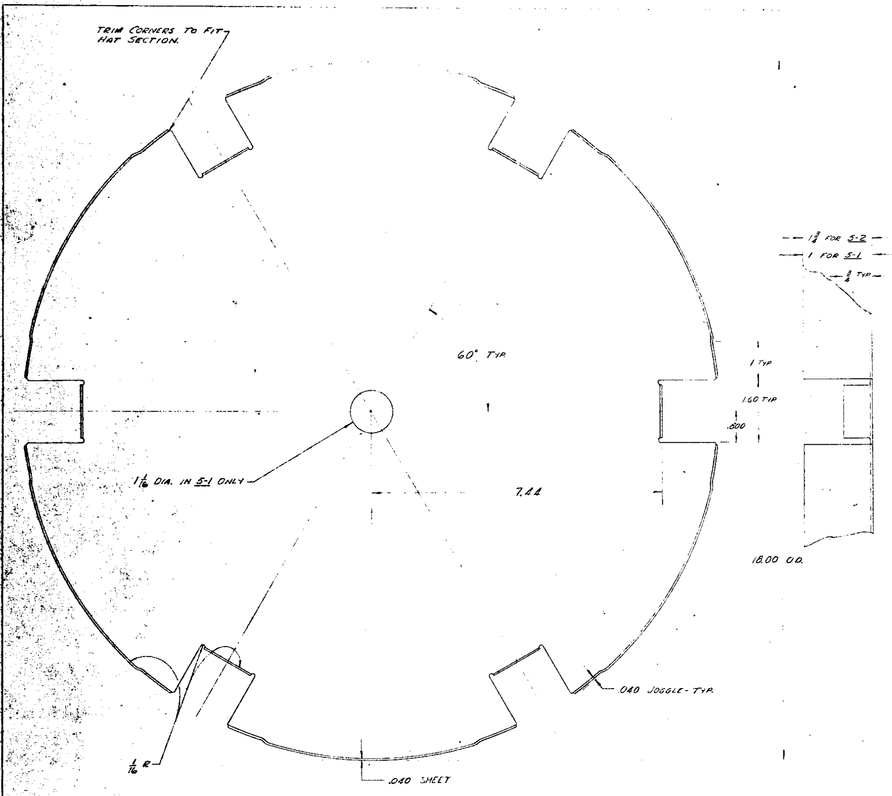
SCALE 1/1 & AS NOTED

U.S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA

CODE 408 D PROB. 501
RAA 10 E 4.4
SHEET 3 OF 16 ALT # D

SHEET 8 OF 81 1-3-56 N.R.L. DWG. NO. E 2573


SECTION B-B
4-5 FITTING
4-7, 4-8 CLIP
4-3 CHANNEL
4-4 CHANNEL CLIP
ADDED ANODIZE



5-1 DECK WEB
5-2 DECK WEB

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
D	ADDED ANODIZE	2-15-56	

NOTE:
1 HEAT TREAT TO T-4 CONDITION AFTER FORMING.

REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	UNIT WT	ZONE
1	5-2	DECK WEB - ANODIZE	AL ALLOY	24S-O	SEE NOTE	
2	5-1	DECK WEB - ANODIZE	AL ALLOY	24S-O	SEE NOTE	

LIST OF MATERIAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
ON FRACTIONS ± 1/64"
ON DECIMALS ± .005"
ON ANGLES ± 1/2°

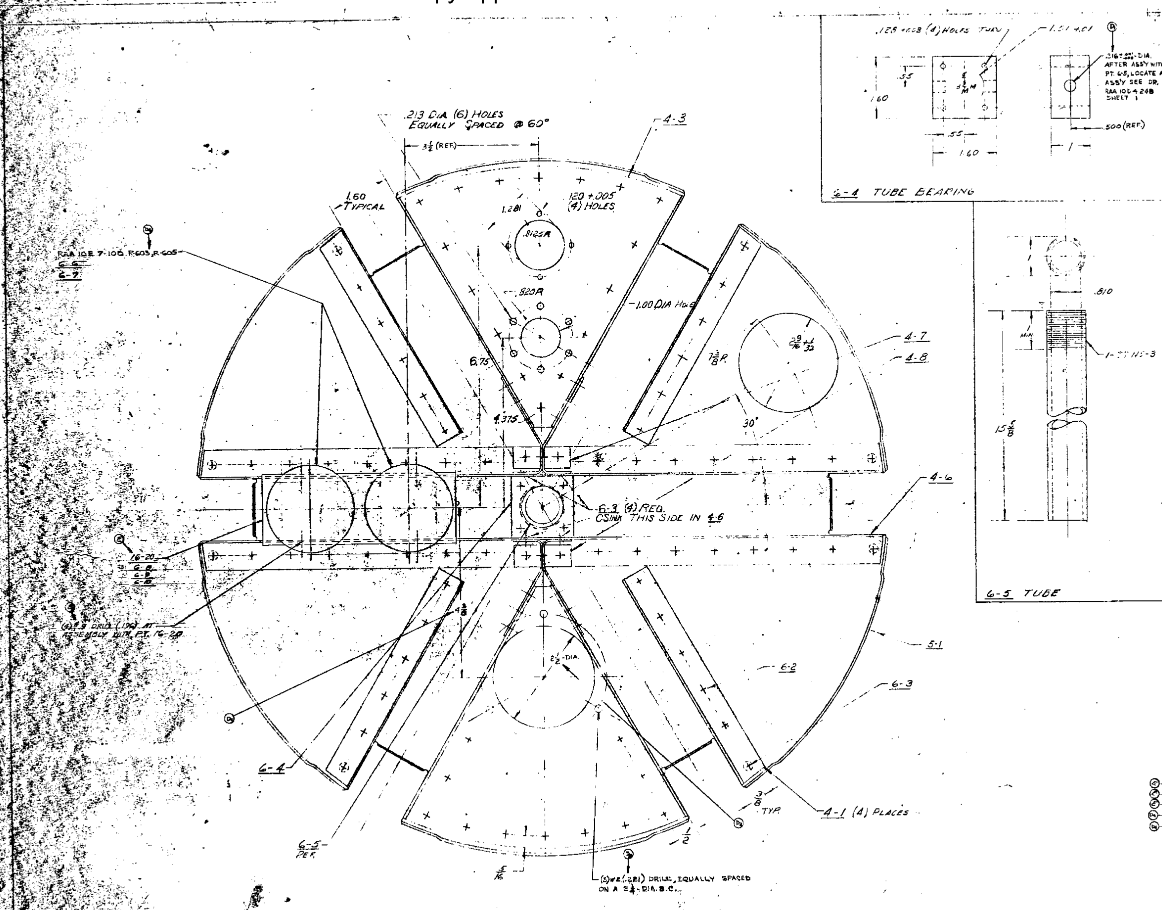
AUTOMATIC WEATHER STA.
STRUCTURE
AN/GMT-1(XG-1)
SCALE 1/1

U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
CODE 405 B FROM 5 D 1
RAA10E4 4
SHEET 5 OF 16 ALT D

SHEET 10 OF 81 1-3-56 N.R.L. DWG. NO. E2573

Sanitized Copy Approved for Release 2011/05/25 : CIA-RDP78-03642A001200050008-5

SYM	REVISIONS — DESCRIPTION	DATE	APPROVAL
D	PT. 6-1 [illegible] DIM WAS [illegible] 1.125 DIA [illegible] DR. WAS .216 [illegible]		
[illegible]	ADDED R-603, R-605, PT. 6-6 & PT. 6-7	1-27-56	[illegible]
D₁	PT 6-4 ADDED .316-HOLE		
F	PT. 6-1 ADDED PTS. 16-20, 6-8, 6-9, 6-10		
E₁	PT. 6-1 ADDED HOLES	3-22-56	[illegible]



NOTES:

RIVETS ARE TO BE EQUALLY SPACED UNLESS DIMENSIONED BRAZIER HEADS ARE ON SMOOTH SIDE OF DECK (OPPOSITE OF SIDE SHOWN) THIS OPPOSITE SIDE IS TO BE POLISHED

RIVET SYMBOLS ARE AS FOLLOWS

+ AN456-AD4

⊕ AN426-AD4 C'SUNK HEAD ON OTHER SIDE

REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION
4	6-10	HEX NUT #10-32	STEEL C.P.	COMM.
4	6-9	EXT. TOOTH LOCKWASHER	STEEL C.P.	COMM.
4	6-8	RD. HD. SCREW #10-32 X ⅝	STEEL C.P.	COMM.
8	6-7	EXT. TOOTH LOCKWASHER	STEEL C.P.	COMM.
8	6-6	RD. HD. SCREW #6-32 X ¼	STEEL C.P.	COMM.
1	6-5	TUBE	AL. ALLOY	ALCOA 24S-T4
1	6-4	TUBE BEARING	PHENOLIC	CANVAS BASE
	5-1	DECK WEB		
	4-8	CLIP		
	4-7	CLIP		
	4-6	ANGLE		
	4-3	STIFFENER PLATE		
	4-1	ANGLE		
	6-3	AN426-AD4	AL. ALLOY	A13-T
	6-2	AN456-AD4	AL. ALLOY	A13-T
	6-1	UPPER DECK SUB-ASSY		

LIST OF MATERIAL

AUTOMATIC WEATHER STA

STRUCTURE

AN/GMT-1(XG-1)

U. S. NAVY ELECTRONICS LABORATORY, SAN DIEGO 52, CALIFORNIA

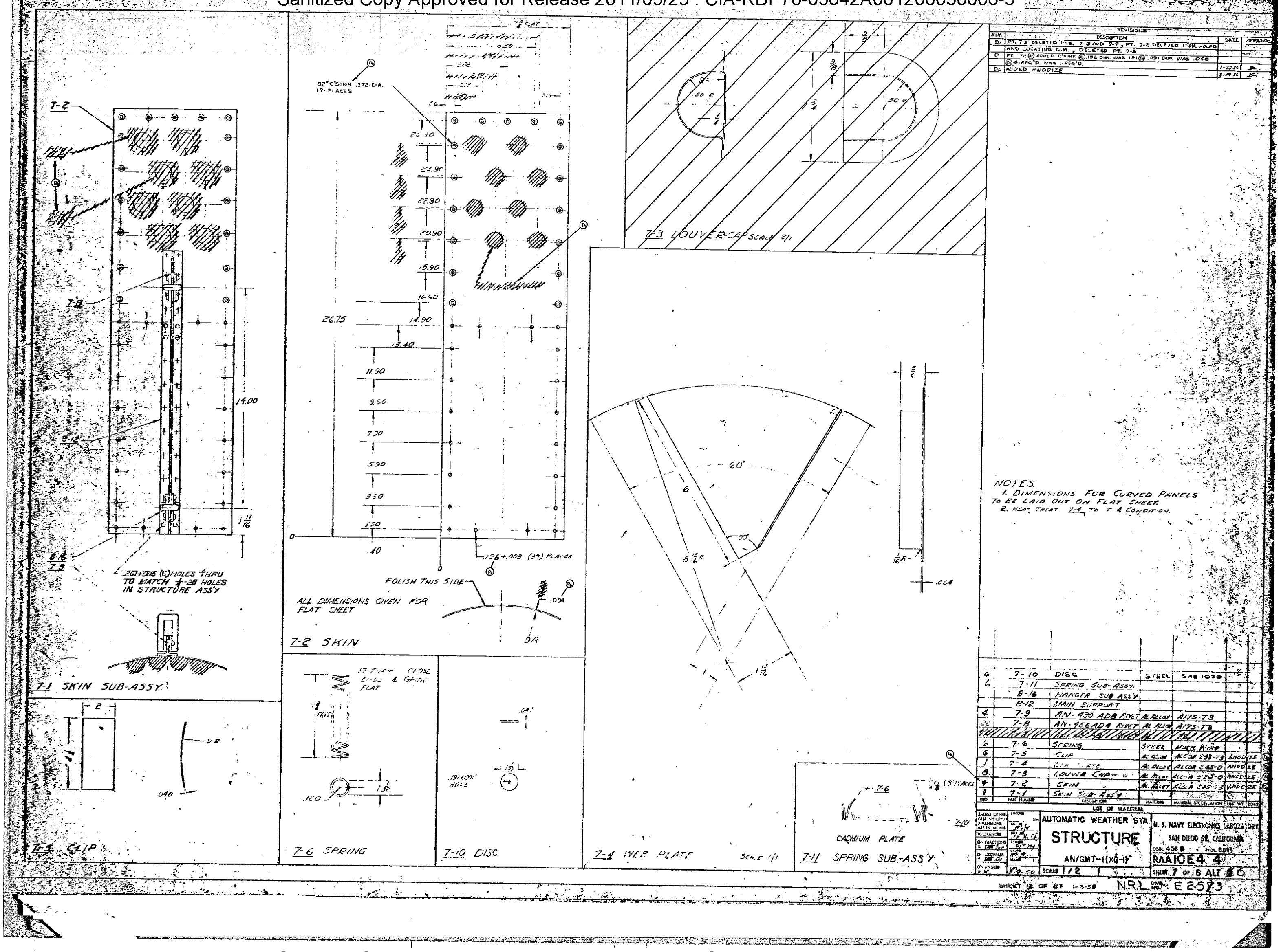
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

DRAWN S. MORAN — 28 DEC 48

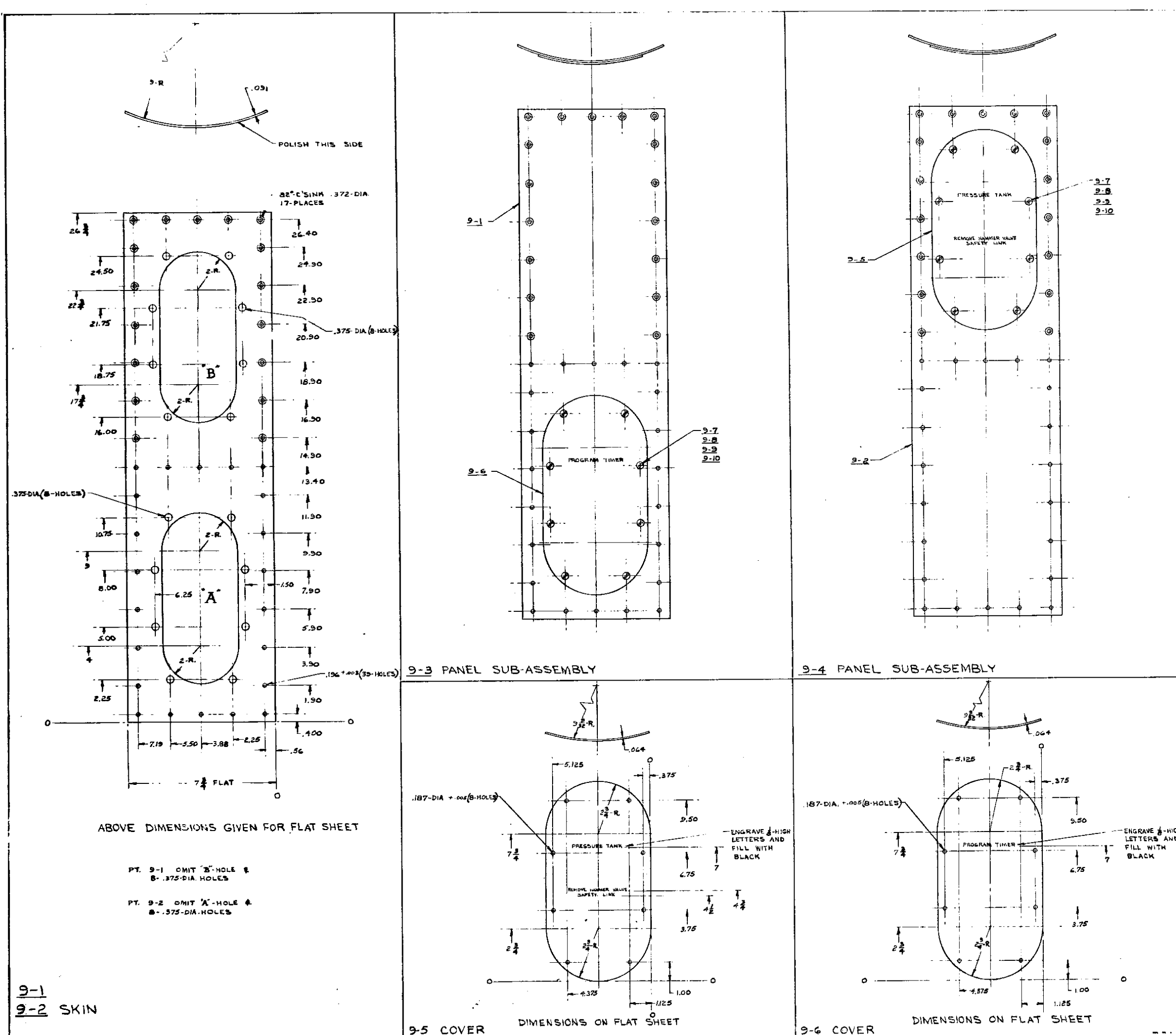
SCALE 1/1

RAA 10E4 4

SHEET 6 OF 15


REVISIONS
SYM | DESCRIPTION | DATE | APPROVAL
D1 PT. 7-1 DELETED PTS. 7-3 AND 7-7, PT. 7-2 DELETED 1" DIA. HOLED AND LOCATING DIM., DELETED PT. 7-8
D PT. 7-2 (D) ADDED C'SINK (D) .196 DIM. WAS .191 (D) .091 DIM. WAS .040 (D) 4-REQ'D. WAS 1-REQ'D.
D2 ADDED ANODIZE
1-27-56
2-19-56
7-2
7-8
8-12
8-16
7-9
14.00
.261±.005 (C) HOLES THRU TO MATCH 1/4-28 HOLES IN STRUCTURE ASS'Y
7-1 SKIN SUB-ASSY.
82° C'SINK .372-DIA. 17-PLACES
26.75
26.40
24.90
22.90
20.90
18.90
16.90
14.90
13.40
11.90
9.90
7.90
5.90
3.90
1.90
.10
.196+.003 (37) PLACES
POLISH THIS SIDE
.091
9R
ALL DIMENSIONS GIVEN FOR FLAT SHEET
7-2 SKIN
7-3 LOUVER CAP SCALE 2/1
60°
6
90°
1/16 R
.064
NOTES.
1. DIMENSIONS FOR CURVED PANELS TO BE LAID OUT ON FLAT SHEET.
2. HEAT TREAT 7-4 TO T-4 CONDITION.
2
.040
5R
7-5 CLIP
17 TURNS CLOSE ENDS & GRIND FLAT
FREE
.120
1 1/2
7-6 SPRING
.191 DIA. HOLE
7-10 DISC
7-4 WEB PLATE
SCALE 1/1
7-6
(3) PLACES
7-10
CADMIUM PLATE
7-11 SPRING SUB-ASSY
LIST OF MATERIAL
REQ | PART NUMBER | DESCRIPTION | MATERIAL | MATERIAL SPECIFICATION | UNIT WT | ZONE
6 | 7-10 | DISC | STEEL | SAE 1020
6 | 7-11 | SPRING SUB-ASSY.
8-16 | HANGER SUB ASS'Y
8-12 | MAIN SUPPORT
4 | 7-9 | AN-430 AD8 RIVET | AL ALLOY | A17S-T3
22 | 7-8 | AN-456AD4 RIVET | AL ALLOY | A17S-T3
6 | 7-6 | SPRING | STEEL | MUSIC WIRE
6 | 7-5 | CLIP | AL ALLOY | ALCOA 24S-T3 | ANODIZE
1 | 7-4 | WEB PLATE | AL ALLOY | ALCOA 24S-0 | ANODIZE
8 | 7-3 | LOUVER CAP | AL ALLOY | ALCOA 24S-0 | ANODIZE
4 | 7-2 | SKIN | AL ALLOY | ALCOA 24S-T3 | ANODIZE
1 | 7-1 | SKIN SUB-ASS'Y
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
ON FRACTIONS
ON DECIMALS ± .01
ON ANGLES
AUTOMATIC WEATHER STA.
STRUCTURE
AN/GMT-1(XG-1)
SCALE 1/2
U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
RAA10E4 4
SHEET 7 OF 16 ALT D
SHEET 12 OF 83 1-3-58
N.R.L. DWG. NO. E 2573

REVISION LETTER	DETAIL NO.	BY	DESCRIPTION	CHECKED BY	DATE
D	SHEET 9	SK	SHEET REDRAWN		



DETAIL NO.	DESCRIPTION	MATERIAL SPECIFICATIONS	NO. REQ'D
9-10	AIRLOCK STUD NO. 38293-2-190 STEEL	COMM.	16
9-9	AIRLOCK RECEPT. NO. 55967-P058 STEEL	COMM.	16
9-8	AIRLOCK PIN NO. 55785-2 STEEL CAD. PLATE	COMM.	16
9-7	AN426AD3 RIVET ALUM. ALLOY	A17S-T3	32
9-6	COVER ALUM. ALLOY-ANODIZE	2024-T3	1
9-5	COVER ALUM. ALLOY-ANODIZE	2024-T3	1
9-4	PANEL SUB-ASSEMBLY		1
9-3	PANEL SUB-ASSEMBLY		1
9-2	SKIN ALUM. ALLOY-ANODIZE	2024-T3	1
9-1	SKIN ALUM. ALLOY-ANODIZE	2024-T3	1

LIST OF MATERIAL

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL DIMENSIONS ± .005
FRACTIONAL DIMENSIONS ± .005
ANGLE DIMENSIONS ± 2°
DIMENSIONS IN INCHES

REFERENCE DRAWINGS

DO NOT SCALE DRAWINGS

SECURITY CLASSIFICATION: UNCLASSIFIED

NAVAL RESEARCH LABORATORY
WASHINGTON 25, D. C.

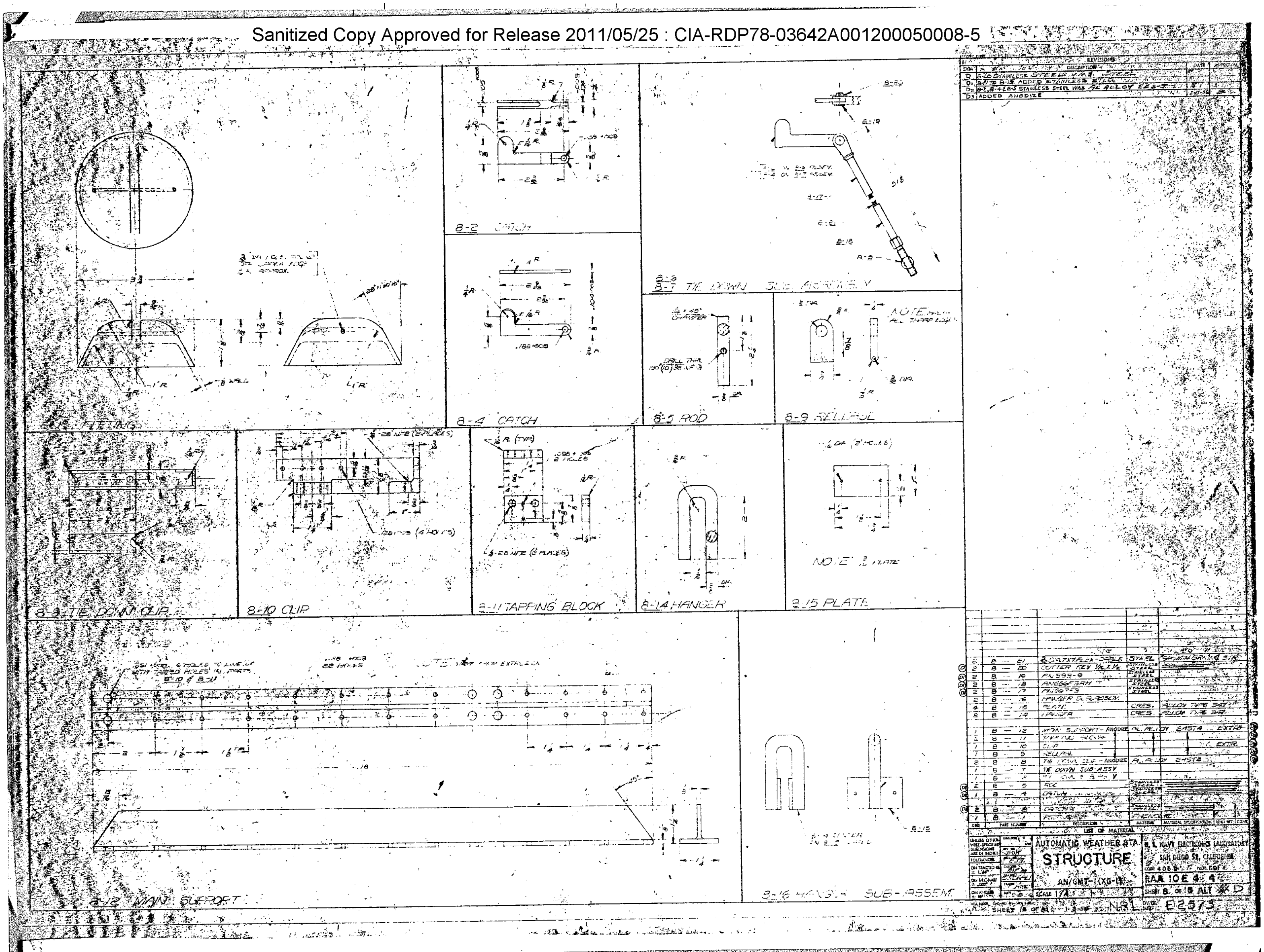
AUTOMATIC WEATHER STATION
STRUCTURE
AN/GMT-1 (XG-1)

SIZE 2 | 271 | 612

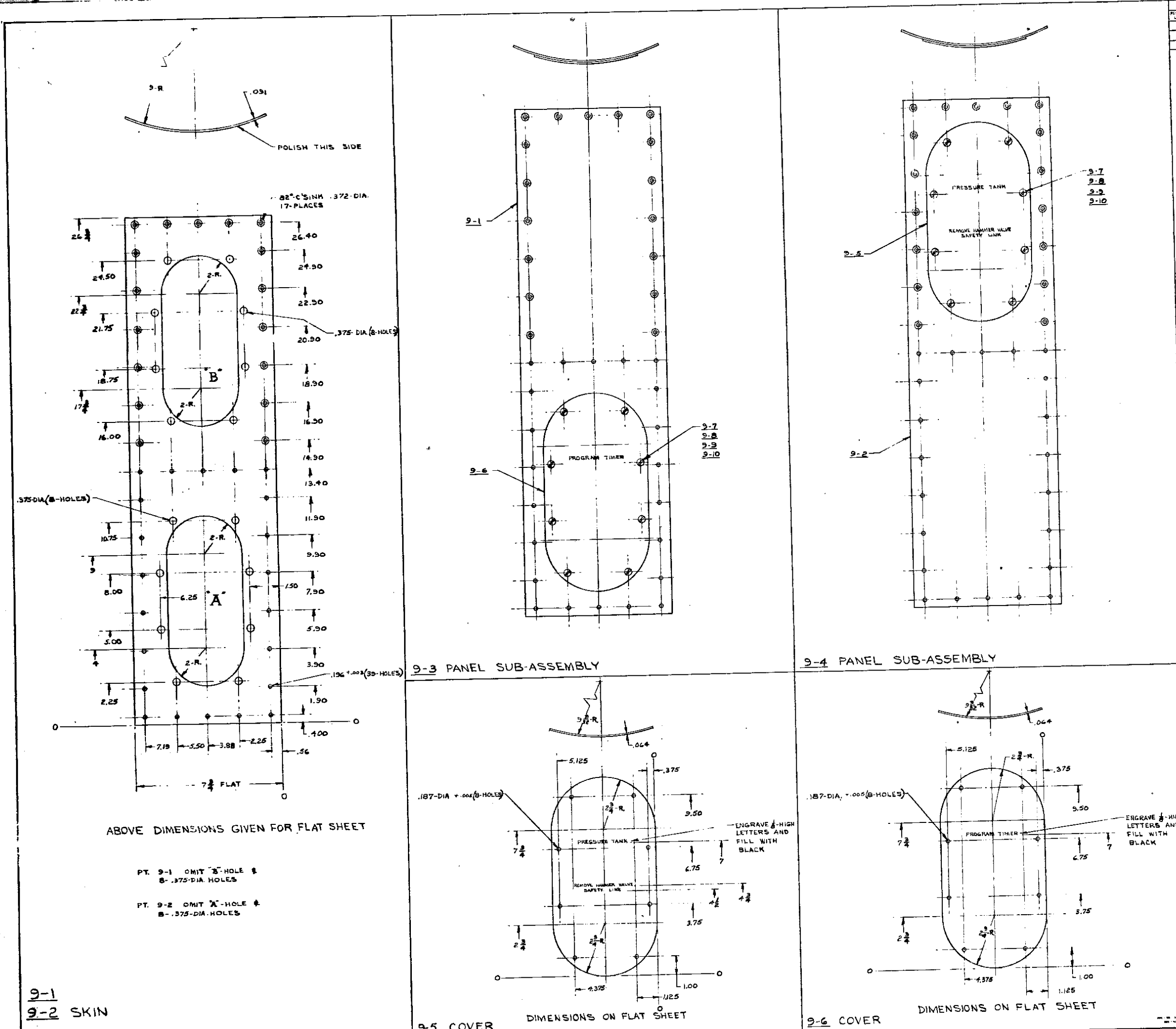
SIGNATURES		DATE
DESIGN		
DRAWN		1-3-56
CHECKED		4/27/56
UNIT		
ENGINEER		
DIVISION		

SCALE 1/2 — FOR EXPERIMENTAL FABRICATION ONLY — DWG. NO. NEL RAA 10E 44 D — SHEET 9 OF 16

SHEET 14 OF 81 1-3-56 N.R.L. DWG. NO. D2573


REVISIONS
ADDED ANODIZE
8-2 CATCH
8-4 CATCH
8-7 TIE DOWN SUB-ASSEMBLY
8-5 ROD
8-9 RELIEF
8-8 TIE DOWN CLIP
8-10 CLIP
8-11 TAPPING BLOCK
8-14 HANGER
8-15 PLATE
NOTE $\frac{1}{8}$ PLATE
8-12 MAIN SUPPORT
8-16 HANGER SUB-ASSEM.
2 8-21 $\frac{3}{32}$ DIA 7X7 FLEX-CABLE STEEL
2 8-20 COTTER KEY $\frac{1}{16}$ X $\frac{1}{2}$ STAINLESS STEEL
2 8-19 AN 393-9 STAINLESS STEEL
2 8-18 STAINLESS STEEL
2 8-17 STAINLESS STEEL
2 8-16 HANGER SUB-ASSEMBLY
4 8-15 PLATE CRES. ALLOY TYPE 347
2 8-14 HANGER CRES. ALLOY TYPE 347
1 8-12 MAIN SUPPORT - ANODIZE AL. ALLOY 24ST4 EXTR.
2 8-8 TIE DOWN CLIP - ANODIZE AL. ALLOY 24ST4
1 8-7 TIE DOWN SUB-ASSY
2 8-5 ROD STAINLESS STEEL
1 8-4 CATCH STAINLESS STEEL
2 8-2 CATCH STAINLESS STEEL
REQ PART NUMBER DESCRIPTION MATERIAL MATERIAL SPECIFICATION UNIT WT CODE
LIST OF MATERIAL
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
ON FRACTIONS
ON DECIMALS
ON ANGLES
AUTOMATIC WEATHER STA.
STRUCTURE
AN/GMT-1(XG-1)
U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
RAA 10E 4 4
SHEET 8 OF 18 ALT D
SCALE
NRL
DWG. NO. E2573

REVISION LETTER		BY	REVISIONS DESCRIPTION
D			SHEET REDRAWN



DETAIL NO.	DESCRIPTION		MATERIAL SPECIFICATIONS	NO. REQ'D
9-10	AIRLOCK STUD NO. 98293-2-190 STEEL		COMM.	16
9-9	AIRLOCK RECEPT. NO. 95967-P058 STEEL		COMM.	16
9-8	AIRLOCK PIN NO. 95785-2 STEEL CAD. PLATE		COMM.	16
9-7	AN426AD3 RIVET	ALUM. ALLOY	A17S-T3	32
9-6	COVER	ALUM. ALLOY-ANODIZE	2024-T3	1
9-5	COVER	ALUM. ALLOY-ANODIZE	2024-T3	1
9-4	PANEL SUB-ASSEMBLY			1
9-3	PANEL SUB-ASSEMBLY			1
9-2	SKIN	ALUM. ALLOY-ANODIZE	2024-T3	1
9-1	SKIN	ALUM. ALLOY-ANODIZE	2024-T3	1

LIST OF MATERIAL

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL DIMENSIONS
FRACTIONAL DIMENSIONS
ANGLE DIMENSIONS
DIMENSIONS IN INCHES

REFERENCE DRAWINGS

DO NOT SCALE DRAWING

SECURITY CLASSIFICATION: UNCLASSIFIED

NAVAL RESEARCH LABORATORY
WASHINGTON 25, D. C.

AUTOMATIC WEATHER STATION
STRUCTURE
AN/GMT-1 (XG-1)

SIGNATURES | DATE
DRAWN 1-3-56
CHECKED 1/27/56

SCALE 1/2

FOR EXPERIMENTAL FABRICATION ONLY

DWG. NO. NEL. RAA IOE 44 D

SHEET 9 OF 16

SHEET 14 OF 81 1-3-56 N.R.L. DWG. NO. D2573

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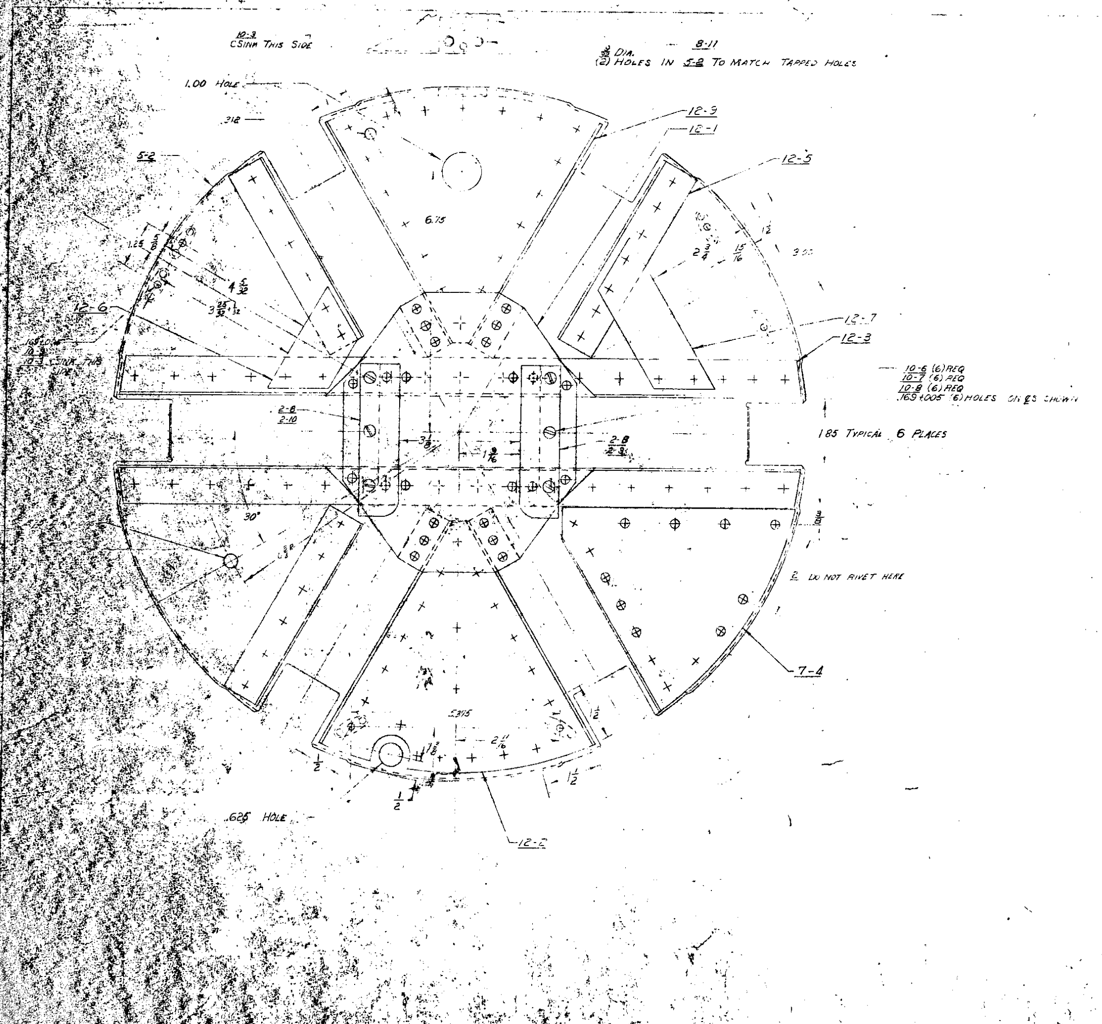
SYM	REVISIONS DESCRIPTION	DATE	APPROVAL



NOTES:
RIVETS ARE TO BE EQUALLY SPACED UNLESS DIMENSIONED
RIVET SYMBOLS ARE AS FOLLOWS
┼ 1/8 DIA RIVET AN430-AD4
⊕ 1/8 DIA. RIVET CSUNK ON SIDE SHOWN AN426-AD4

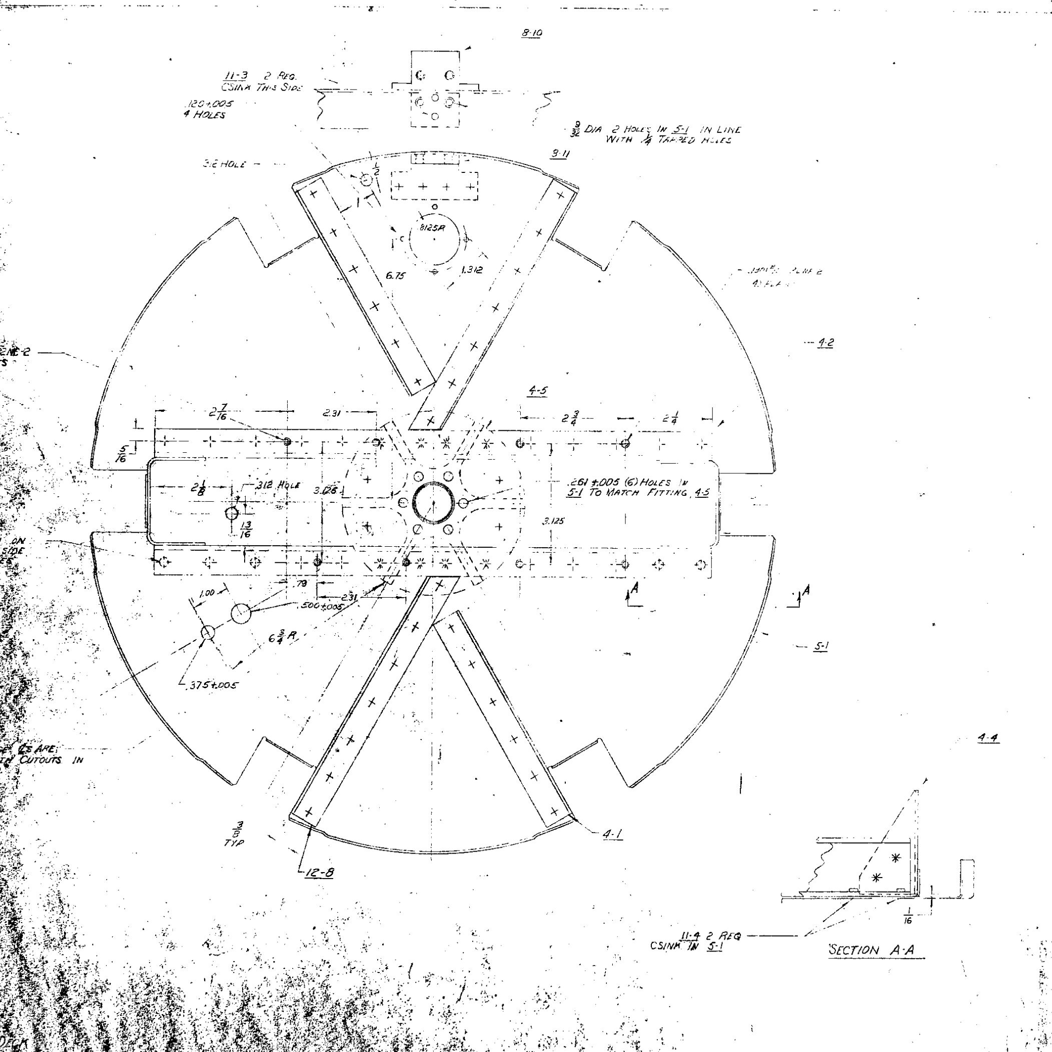
REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION		
	8-11	TAPPING BLOCK				
	2-8	SPACER				
	2-9	HOLD DOWN				
	2-10	HOLD DOWN				
	12-7	GUSSET				
	12-6	GUSSET				
	12-5	ANGLE				
	7-4	WEB PLATE				
	12-3	CHANNEL				
	12-2	WEB PLATE				
	12-1	GUSSET				
	5-2	DECK WEB				
6	10-9	AN366F832 NUT PLATE	STEEL	CAD PL		
6	10-8	8-32 NUT	STEEL	CAD PL		
6	10-7	#8 LOCK WASHER	STEEL	CAD PL		
6	10-6	8-32 RH MS	STEEL	CAD PL		
	10-5	AN430-AD4 RIVET	AL ALLOY	A17S-T		SEE NOTE
	10-4	AN426-AD4 RIVET	AL ALLOY	A17S-T		SEE NOTE
	10-3	AN426-AD3 RIVET		A17S-T		
1	10-1	LOWER DECK SUB ASSY				

LIST OF MATERIAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES; TOLERANCES ON FRACTIONS; ON DECIMALS; ON ANGLES	DRAWN: N. MORAN	AUTOMATIC WEATHER STA STRUCTURE AN/GMT-1(XG-1)	U.S. NAVY ELECTRONICS LABORATORY SAN DIEGO 52, CALIFORNIA CODE 405
		SCALE	RAA10E 4 SHEET 10 OF 15 ALT A

SHEET 15 OF 21 NRL E2573

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



NOTES:

RIVETS ARE TO BE EQUALLY SPACED UNLESS DIMENSIONED
RIVET SYMBOLS ARE AS FOLLOWS
+ AN430-AD4
⊕ AN426-AD4
✱ AN430-AD6

REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	UNIT WT
	8-11	TAPPING BLOCK			
	8-10	CLIP			
	12-8	ANGLE			
	4-5	FITTING			
	4-4	CHANNEL CLIP			
	4-2	CHANNEL			
	4-1	ANGLE			
	5-1	DECK WEB			
	11-5	AN430-AD6 RIVET	AL ALLOY	A17S-T	SEE NOTES
	11-4	AN426-AD4 RIVET	AL ALLOY	A17S-T	SEE NOTES
	11-3	AN426-AD3 RIVET	AL ALLOY	A17S-T	[illegible]
	11-2	AN430-AD4 RIVET	AL ALLOY	A17S-T	[illegible]
1	11-1	MID. DECK SUB-ASSY			

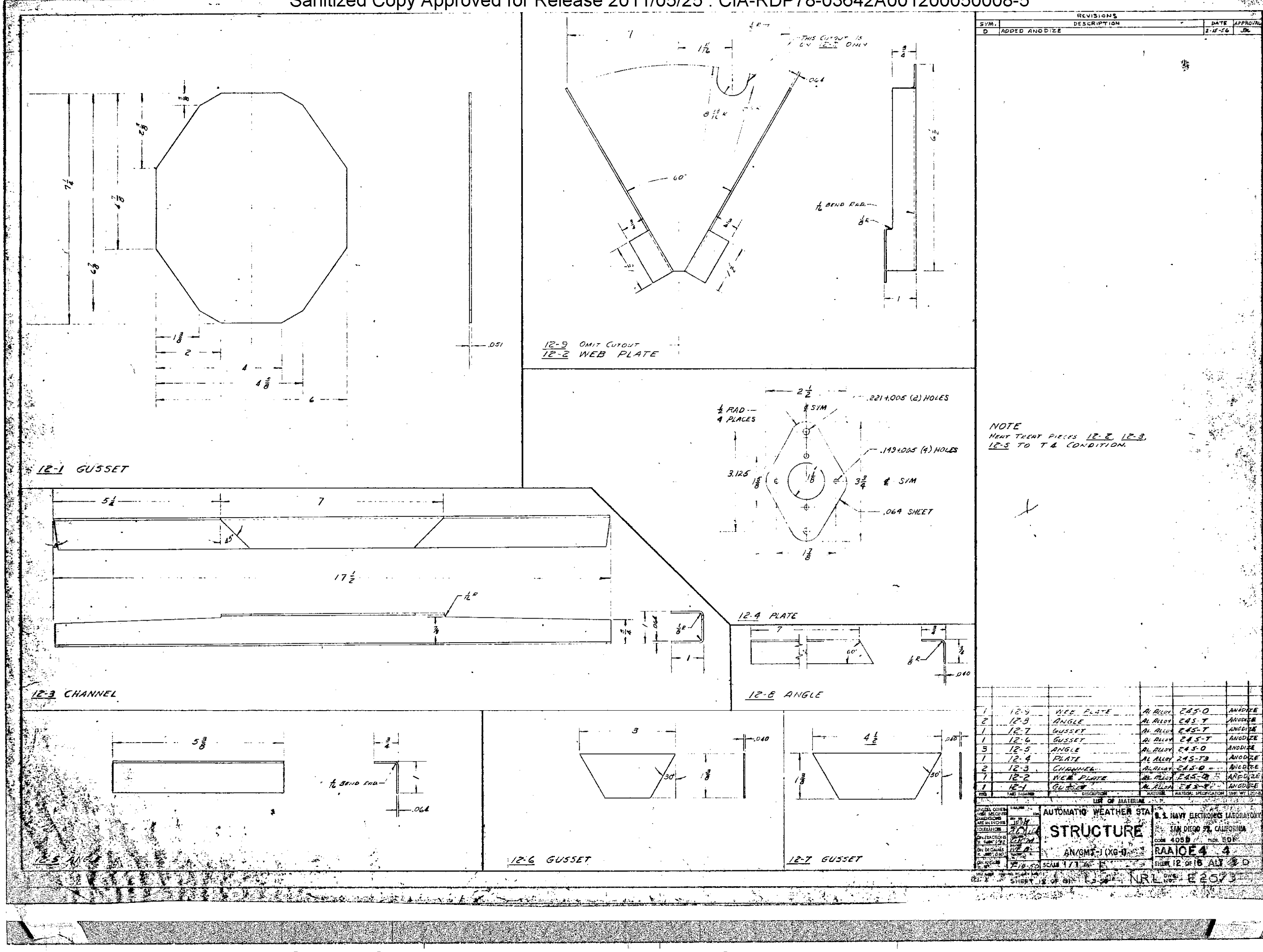
LIST OF MATERIAL

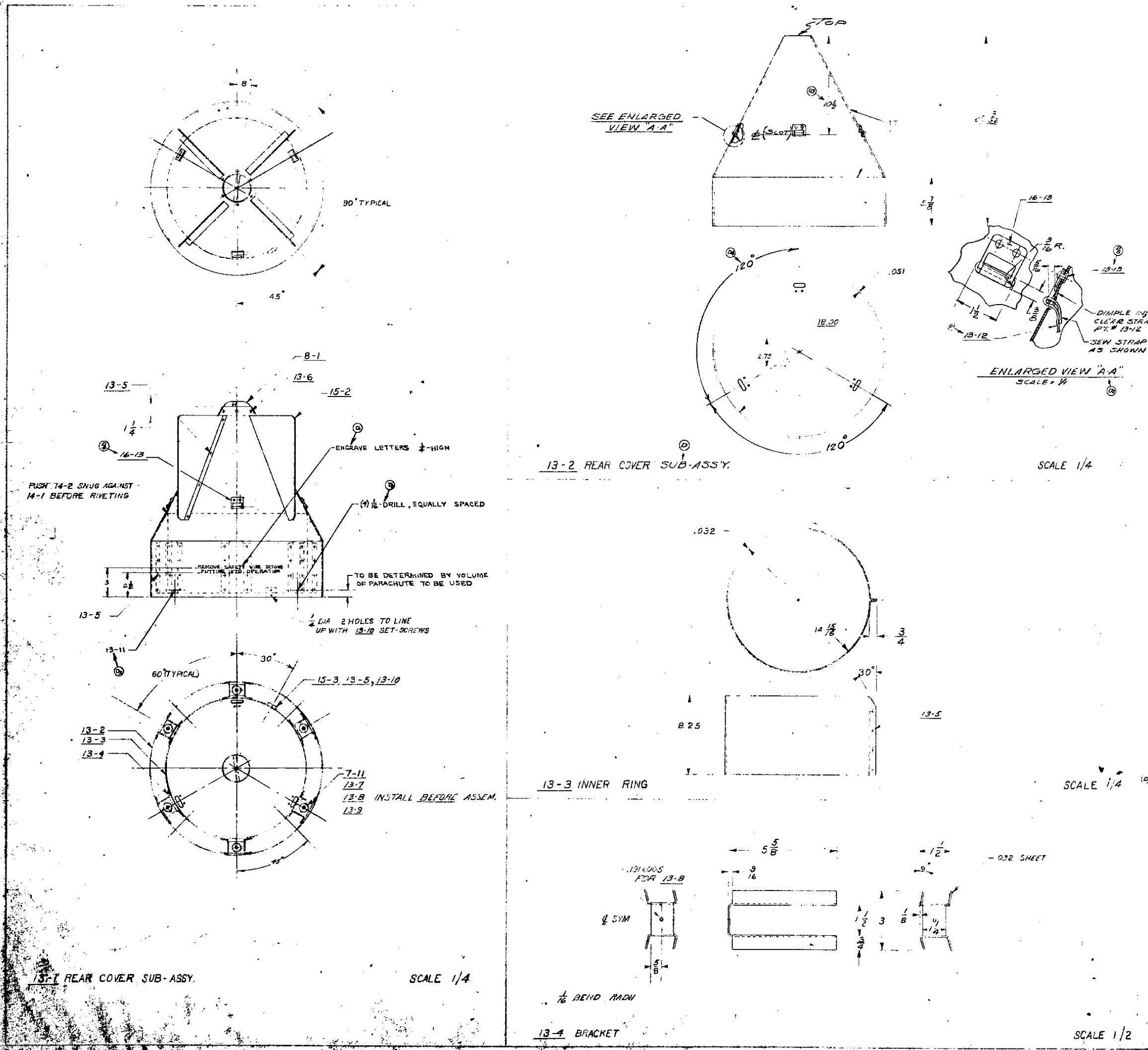
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
ON FRACTIONS ± 1/32
ON DECIMALS ± .010
ON ANGLES ± 1/2°

AUTOMATIC WEATHER STA
STRUCTURE
AN/GMT-1(XG-1)
SCALE

U.S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
RAA 10E4 4
SHEET 11 OF 16 ALT A

SHEET 16 OF 412 NRL E 2573


REVISIONS
D ADDED ANODIZE
12-1 GUSSET
12-9 OMIT CUTOUT
12-2 WEB PLATE
THIS CUTOUT IS ON 12-2 ONLY
12-4 PLATE
.064 SHEET
NOTE
HEAT TREAT PIECES 12-2, 12-3, 12-5 TO T4 CONDITION.
12-3 CHANNEL
12-8 ANGLE
12-5 ANGLE
12-6 GUSSET
12-7 GUSSET
1 12-9 WEB PLATE AL ALLOY 24S-0 ANODIZE
2 12-8 ANGLE AL ALLOY 24S-T ANODIZE
1 12-7 GUSSET AL ALLOY 24S-T ANODIZE
1 12-6 GUSSET AL ALLOY 24S-T ANODIZE
3 12-5 ANGLE AL ALLOY 24S-0 ANODIZE
1 12-4 PLATE AL ALLOY 24S-T3 ANODIZE
2 12-3 CHANNEL AL ALLOY 24S-0 ANODIZE
1 12-2 WEB PLATE AL ALLOY 24S-0 ANODIZE
1 12-1 GUSSET AL ALLOY 24S-T ANODIZE
LIST OF MATERIAL
AUTOMATIC WEATHER STA
STRUCTURE
AN/GMT-1 (XG-1)
U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
RAA IOE4 4
SHEET 12 OF 16
NRL DWG. NO. E2573



REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
D	PT. 13-1 (D1) ADDED ENGRAVING (D2) ADDED (4) 1/8 DRILL (D3) ADDED PT. 13-11		
—	(D4) ADDED PT. 16-13 (SEE SHEET #16)		
D	PT. 13-2 CHANGED FROM DETAIL TO SUBASS'Y.,		
—	(D1) PT. 13-12 ADDED, (D2) ADDED VIEW "A-A"; (D3) ADD-		
—	ED 10 1/2, (D4) ADDED 120°, (D5) ADDED PT. 13-13		
D	B/M - ADDED PT 13-14 (D1) ADDED ANODIZE & CAD. PL.	2-14-56	JB

LIST OF MATERIAL

REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	
1	13-14	35'-0" PARACHUTE		SWITLICK PARACHUTE CO. TRENTON, N.J.	
6	13-13	1/8 DIA. RD. HD. RIVET X 1/4 LG.	AL. ALLOY	COMM.	
3	13-12	1" #B-376, 2400# TENSEL ST.	NYLON WEBBING	PIONEER PARACHUTE CO. INC. MANCHESTER, CONN.	
1	13-11	.055-DIA. X LENGTH TO SUIT	WIRE-STL.	FURN. BY ENG.	
2	13-10	AN565D4H3 CUP POINT HEX SET SCREW	STEEL		
12	13-9	AN426AD3 RIVET	AL. ALLOY	A17S-T3	
6	13-8	AN366F832 NUT PLATE	STEEL		
	15-3	WIRE CLIP			
	15-2	REAR COVER FIN			
	8-1	HOOD FITTING			
	7-11	SPRING SUB-ASSY			
6	13-7	AN515-8-5 RHMS	STEEL		CAD. PL. (D1)
6	13-6	AN504-10-6 SELF TAPPING #S	STEEL		CAD. PL. (D1)
	13-5	AN 455 AD4	AL. ALLOY	ALCOA A17S-T	ANODIZE (D1)
6	13-4	BRACKET	AL. ALLOY	ALCOA 24S-T3	ANODIZE (D1)
1	13-3	INNER RING	AL. ALLOY	ALCOA 24S-T3	ANODIZE (D1)
1	13-2	REAR COVER SUB-ASS'Y	AL. ALLOY	ALCOA 52S-H32	ANODIZE (D1)
1	13-1	REAR COVER SUB-ASS'Y			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
ON FRACTIONS ± 1/32
ON DECIMALS ± .010
ON ANGLES

DR. JFB
W. BALLARD
TRACED M. COVHEN
DATE 9-18-50

AUTOMATIC WEATHER STA.

STRUCTURE

AN/GMT-1(XG-1)

SCALE NOTED

U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA

CODE 4054 PROB. 50

RAA 10 E 4 4

SHEET 18 OF 18 ALT D

SHEET 18 OF

NRL DWG. NO. E2573

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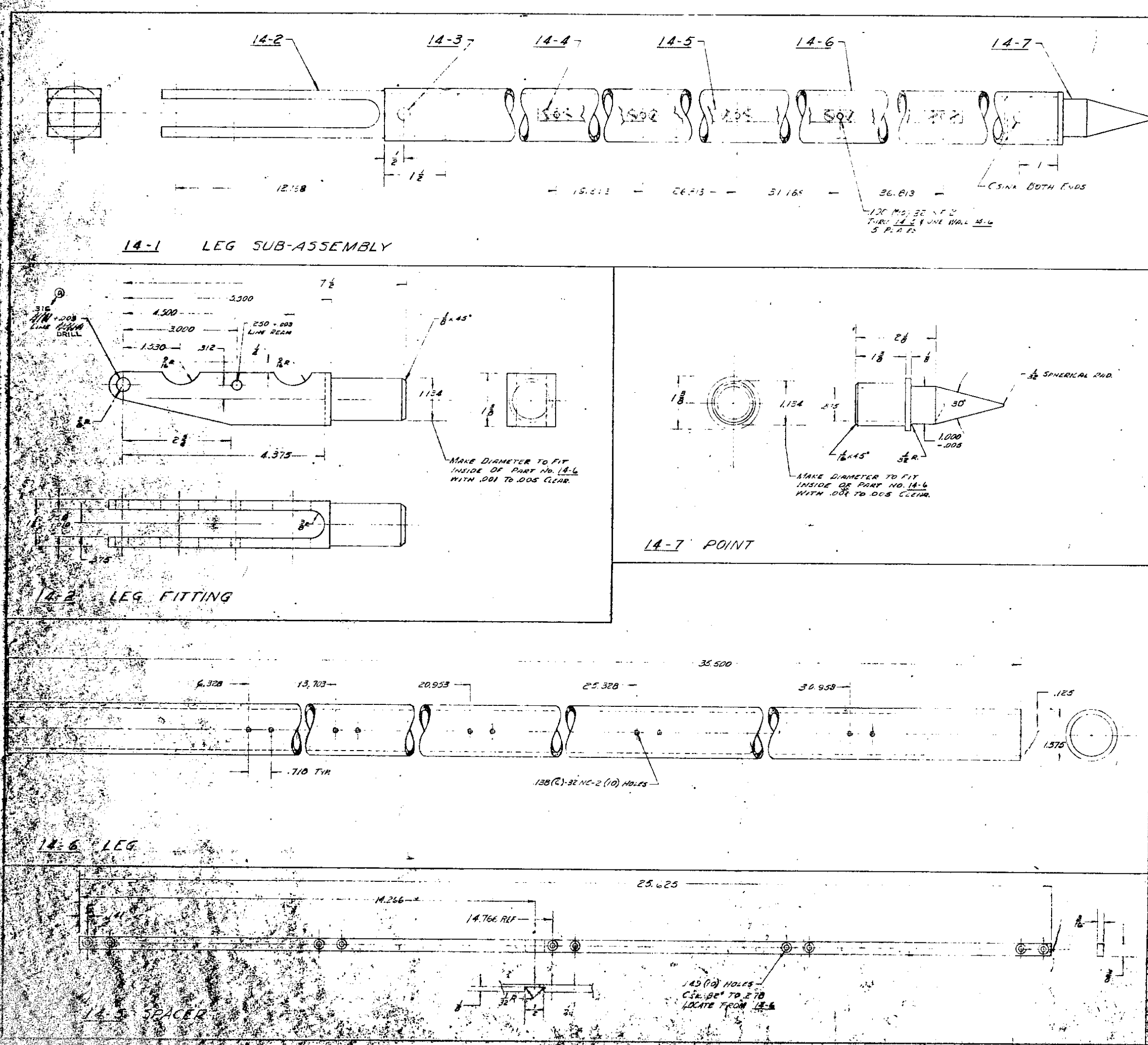


REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
D	PT 14 2 D, .316-DRILL WAS .313 REAM	2-14-52	
D2	ADDED ANODIZE AND CAD. PL.		

LIST OF MATERIAL

REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	UNIT WT	ZONE
6	14-7	POINT	AL. ALLOY	ALCOA 24S-T4	ANODIZE	
6	14-6	LEG	AL. ALLOY	ALCOA 24S-T3	ANODIZE	
6	14-5	SPACER	AL. ALLOY	ALCOA 24S-T4	ANODIZE	
60	14-4	AN-505-6-5	STEEL		CAD.	PL.
18	14-3	AN 426 AD6-24 RIVET	AL. ALLOY	A17S-T3		
6	14-2	LEG FITTING	AL. ALLOY	ALCOA 24S-T4	ANODIZE	
6	14-1	LEG SUB-ASSEMBLY				

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ON FRACTIONS ±1/64; ON DECIMALS ±.010; ON ANGLES

AUTOMATIC WEATHER STA.

STRUCTURE

AN/GMT-1(XG-1)

SCALE 1/1

U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA

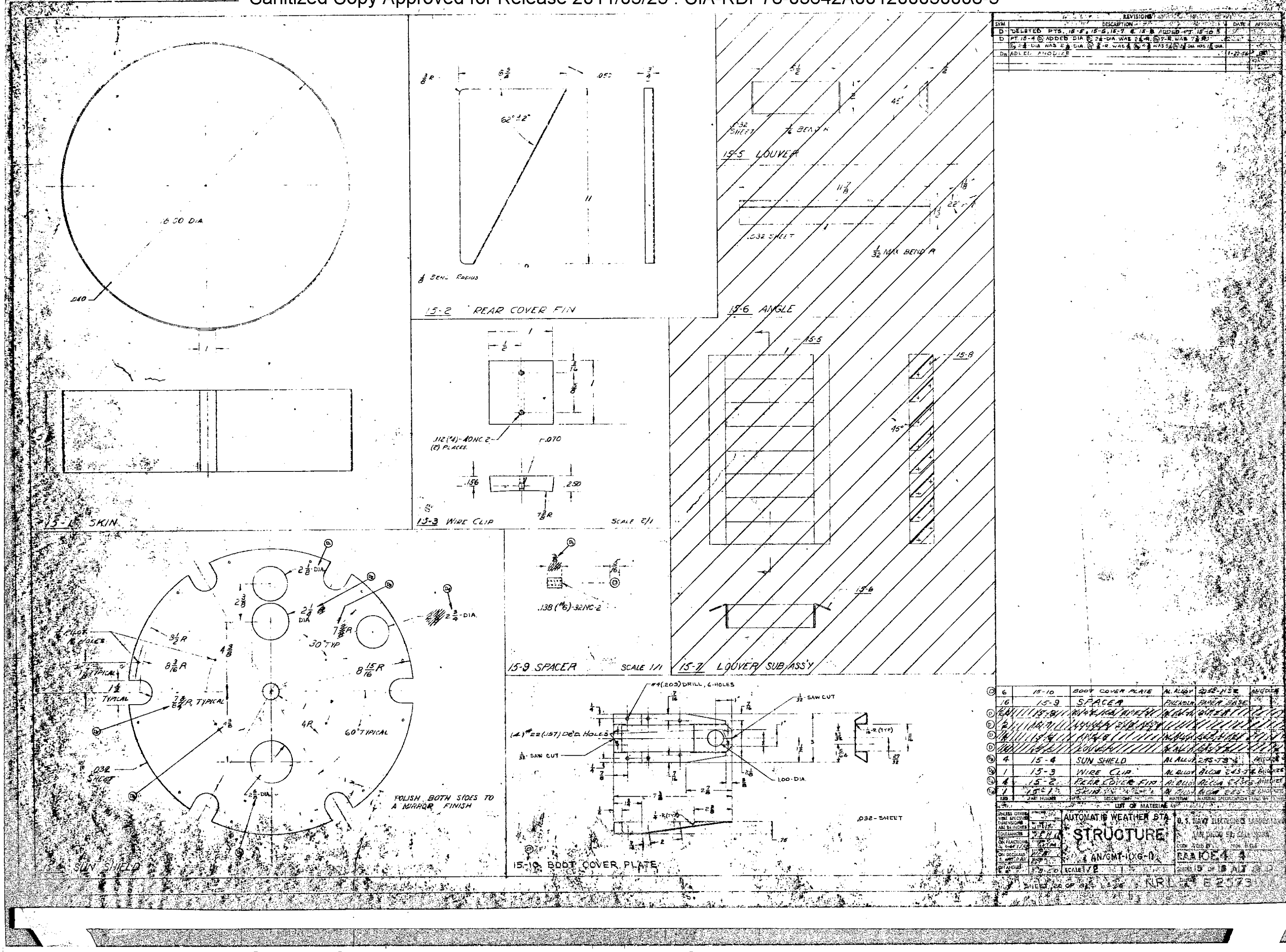
CODE 405D FROM 5D1

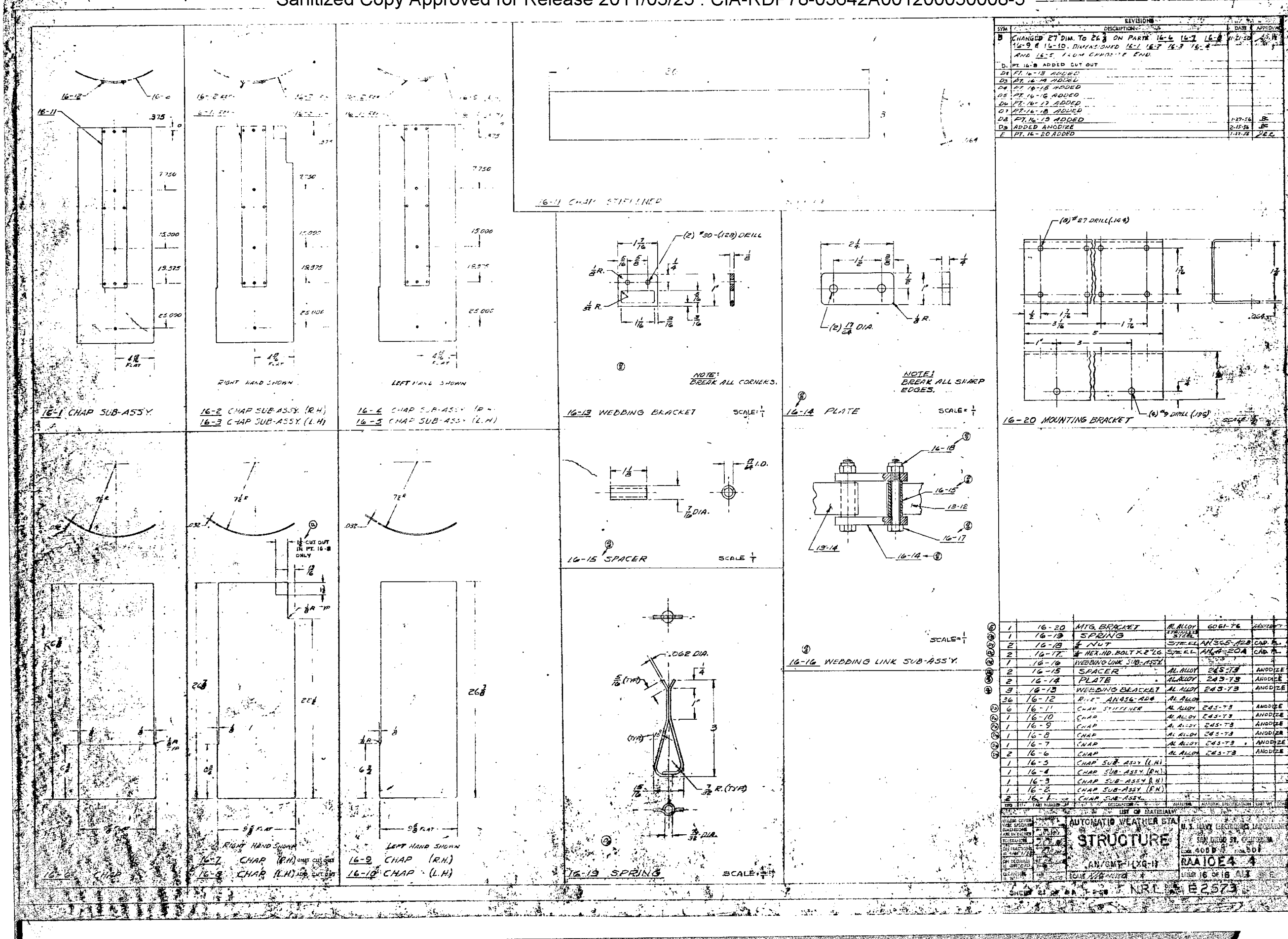
RAA 10 E4 4

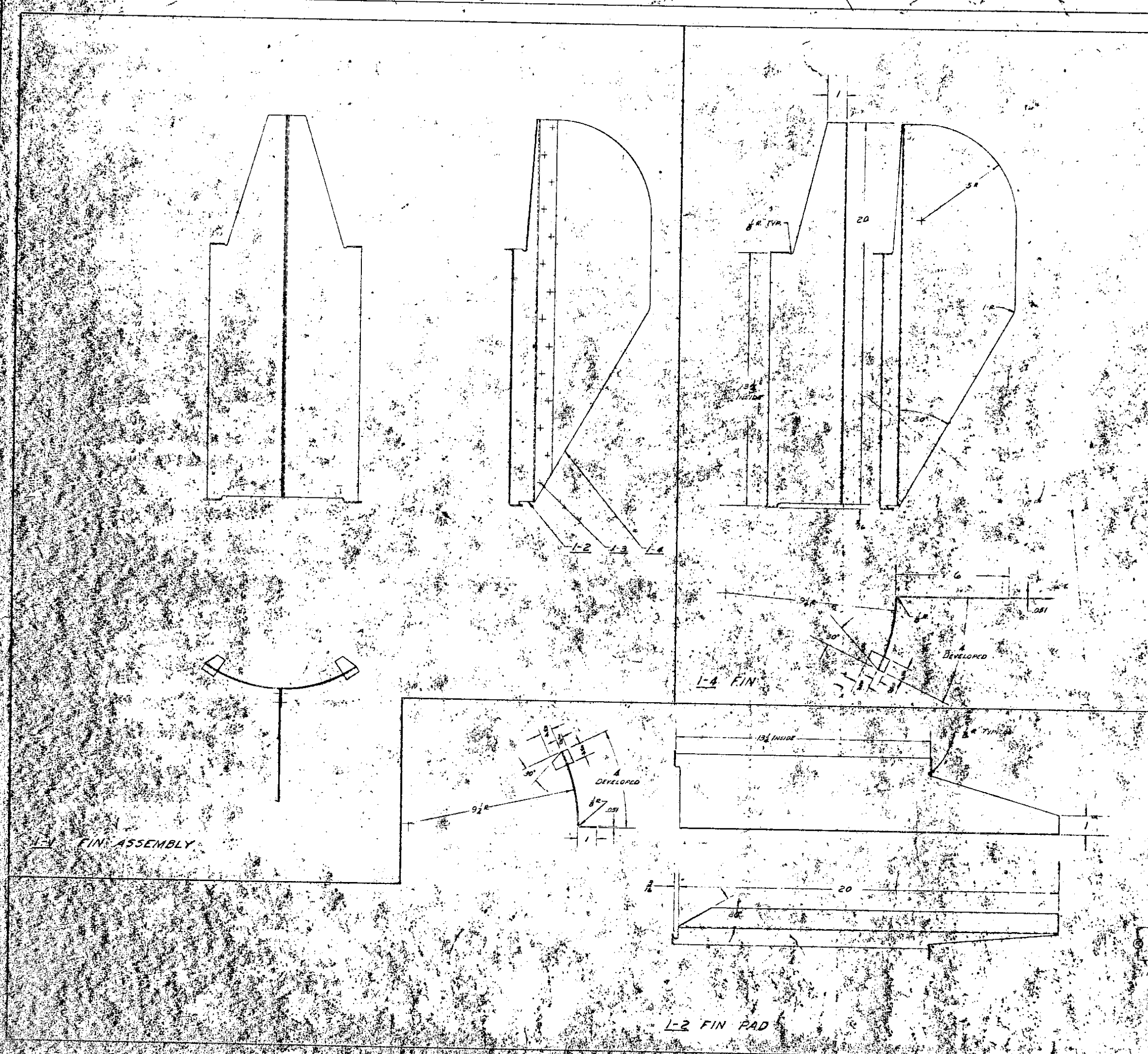
SHEET 14 OF 16 ALT. D

SHEET 16 OF 81 N.R.L. DWG. NO. E2573

Sanitized Copy Approved for Release 2011/05/25 : CIA-RDP78-03642A001200050008-5


15-1 SKIN
15-2 REAR COVER FIN
15-3 WIRE CLIP
SCALE 2/1
15-5 LOUVER
15-6 ANGLE
15-7 LOUVER SUB ASS'Y
15-9 SPACER
SCALE 1/1
15-10 BOOT COVER PLATE
POLISH BOTH SIDES TO A MIRROR FINISH
.032 SHEET
1.00 DIA
.032-SHEET
15-10 BOOT COVER PLATE
15-9 SPACER
15-4 SUN SHIELD
15-3 WIRE CLIP
15-2 REAR COVER FIN
LIST OF MATERIAL
AUTOMATIC WEATHER STA.
STRUCTURE
AN/GMT-1(XG-1)
NRL


REVISIONS
SYM | DESCRIPTION | DATE | APPROVAL
B | CHANGED 27" DIM. TO 26 ON PARTS 16-6 16-7 16-8 16-9 & 16-10. DIMENSIONED 16-1 16-2 16-3 16-4 AND 16-5 FROM OPPOSITE END. | 11-21-50
D1 | PT. 16-8 ADDED CUT OUT
D2 | PT. 16-13 ADDED
D3 | PT. 16-14 ADDED
D4 | PT. 16-15 ADDED
D5 | PT. 16-16 ADDED
D6 | PT. 16-17 ADDED
D7 | PT. 16-18 ADDED
D8 | PT. 16-19 ADDED | 1-27-56
D9 | ADDED ANODIZE | 2-15-56
E | PT. 16-20 ADDED
16-1 CHAP SUB-ASSY.
16-2 CHAP SUB-ASSY. (R.H.)
16-3 CHAP SUB-ASSY. (L.H.)
RIGHT HAND SHOWN
LEFT HAND SHOWN
16-11 CHAP STIFFENER
16-13 WEBBING BRACKET
NOTE: BREAK ALL CORNERS.
16-14 PLATE
NOTE: BREAK ALL SHARP EDGES.
16-20 MOUNTING BRACKET
16-15 SPACER
16-16 WEBBING LINK SUB-ASS'Y.
16-6 CHAP
16-7 CHAP (R.H.)
16-8 CHAP (L.H.)
16-9 CHAP (R.H.)
16-10 CHAP (L.H.)
16-19 SPRING
1 | 16-20 | MTG. BRACKET | AL. ALLOY | 6061-T6
1 | 16-19 | SPRING | STAINLESS STEEL
2 | 16-18 | 1/4 NUT | STEEL | AN365-428 | CAD. PL.
2 | 16-17 | 1/4 HEX. HD. BOLT X 2" LG. | STEEL | AN4-20A | CAD. PL.
1 | 16-16 | WEBBING LINK SUB-ASSY.
2 | 16-15 | SPACER | AL. ALLOY | 24S-T3 | ANODIZE
2 | 16-14 | PLATE | AL. ALLOY | 24S-T3 | ANODIZE
3 | 16-13 | WEBBING BRACKET | AL. ALLOY | 24S-T3 | ANODIZE
36 | 16-12 | RIVET AN456-AD4 | AL. ALLOY
6 | 16-11 | CHAP STIFFENER | AL. ALLOY | 24S-T3 | ANODIZE
1 | 16-10 | CHAP | AL. ALLOY | 24S-T3 | ANODIZE
1 | 16-9 | CHAP | AL. ALLOY | 24S-T3 | ANODIZE
1 | 16-8 | CHAP | AL. ALLOY | 24S-T3 | ANODIZE
1 | 16-7 | CHAP | AL. ALLOY | 24S-T3 | ANODIZE
2 | 16-6 | CHAP | AL. ALLOY | 24S-T3 | ANODIZE
1 | 16-5 | CHAP SUB-ASSY (L.H.)
1 | 16-4 | CHAP SUB-ASSY. (R.H.)
1 | 16-3 | CHAP SUB-ASSY (L.H.)
1 | 16-2 | CHAP SUB-ASSY (R.H.)
2 | 16-1 | CHAP SUB-ASSY.
LIST OF MATERIAL
AUTOMATIC WEATHER STA.
STRUCTURE
AN/GMT-1 (XG-1)
U.S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
RAA 10E4 4
SHEET 16 OF 16
NRL E2573



REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
B	CHANGED $13\frac{3}{8}$ DIM. TO $13\frac{3}{4}$ DIM.		
D	ADDED ANODIZE	2-15-56	
E	ADDED NO. REQ'D.	3-22-56	

REQ.	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPEC.	
4	1-4	FIN	AL. ALLOY	24S-T3	ANODIZE
56	1-3	RIVET	AL. ALLOY	AN456-KD4	ANODIZE
4	1-2	FIN PAD	AL. ALLOY	24S-T3	ANODIZE
4	1-1	FIN ASSEMBLY			

LIST OF MATERIAL

AUTOMATIC WEATHER STATION

FIN

AN/FMT-

U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA

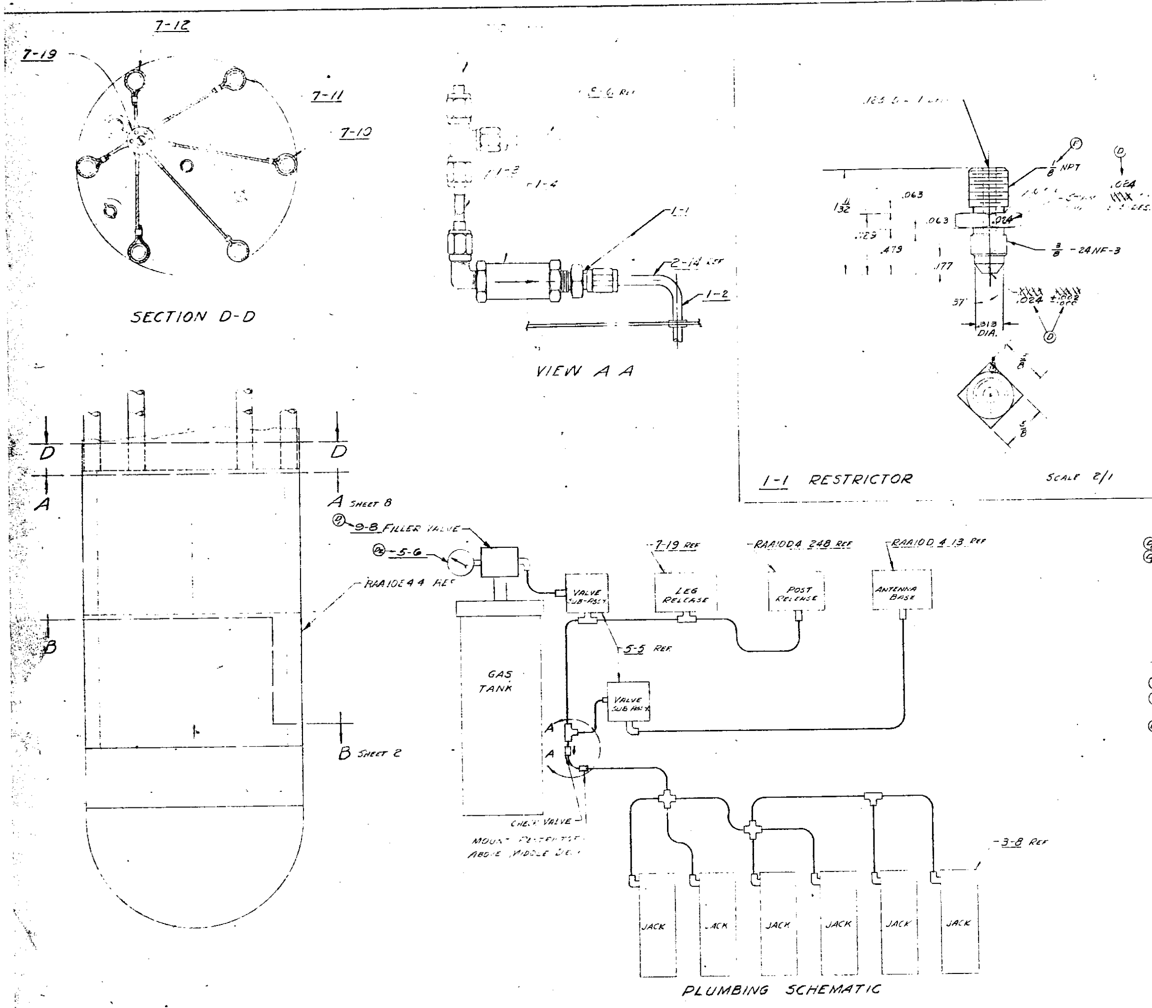
CODE RAA 10 E 4 213

SHEET 1 OF 1

SHEET 22 OF 81 1-3-56

NRL DWG. NO. E2573

Sanitized Copy Approved for Release 2011/05/25 : CIA-RDP78-03642A001200050008-5



REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
B	CHANGED ... INTO 5-5 IN SCHEMATIC ... WAS ... HAMMER ... 1-3 & 1-4. CHANGED SHEET 2,5&8	11-15-55	J.S.H.
D	REVISED PT.# 1-1 (STAMP NO. FROM .014 TO .024 +.002 -.000 , REVISED SHEETS 2,3,4,5,6,7 & 8 ADDED SH. 9		
D1	ADDED PT.# 9-8		
D2	ADDED PT.# 5-6		
D3	NOTE 2 WAS WHITE LEAD		
D4	ADDED NOTE 4	1-30-56	J.C.C.
E	PT. 1-1 PIPE TH'D ADDED		
E	PT. 1-2 DELETED ALSO SEE SHEETS 2 & 5	3-21-56	J.C.C.

NOTE:
1. ALL PLUMBING IS TO HAVE CLEARANCE WITH EQUIPMENT INSTALLED AS PER DRAWING NO. RAA10E4 ...
2. USE ... (GENERAL ELECTRIC) ON ALL PIPE THREADS.
3. A MINIMUM CLEARANCE OF 1" IS TO BE MAINTAINED AROUND ANTENNA.
4. FILL SYSTEM WITH NITROGEN OR HELIUM GAS ONLY.

REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION
1	1-4	CHECK VALVE (CIRCLE SEAL & CHECK)	No. 259A-1PP.	MFG. BY JAMES POND & CLARK OR EQUIV.
1	9-8	FILLER VALVE (ARGON) # 133		KEROTEST CO.
1	5-6	HI-PRESSURE GAGE 0 TO 3000 LBS & SIZE ...		AIR REDUCTION (AIRCO) VALVE CO.
	5-5	VALVE SUB-ASSY.		
	3-8	JACK		
REF	RAA10E44	STRUCTURE		
	RAA10D4 13	ANTENNA INSTALLATION		
	RAA10D4 24B	POST RELEASE		
	~~[illegible]~~	~~HIGH PRESSURE AIR VALVE~~		
	~~[illegible]~~	~~HIGH PRESSURE AIR ...~~		
1	1-3	TUBE 3/16 OD × .035	AL. ALLOY	52S-0
~~1~~	~~1-2~~	~~TUBE 3/16 OD × ...~~	~~AL. ALLOY~~	~~52S-0~~
1	1-1	RESTRICTOR	AL. ALLOY	24S-T4
	2-4	TUBE		
	8-7	TUBE		
	8-6	TUBE		
	7-19	LEG RELEASE SUB-ASSY.		
	7-12	CABLE SUB-ASSY.		
	7-11	CABLE SUB-ASSY		
	7-13	CABLE SUB-ASSY		

LIST OF MATERIAL — QUANTITIES ARE FOR ONE UNIT

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
ON FRACTIONS ± 1/64"
ON DECIMALS ± .005"
ON ANGLES

DIRECTOR — USN
CHECKED
DRAWN W.E. BALLARD
TRACED
DATE

AUTOMATIC WEATHER STA.

SELF-RIGHTING MECHANISM

AN/GMT-1(XG-1)

SCALE 1/1

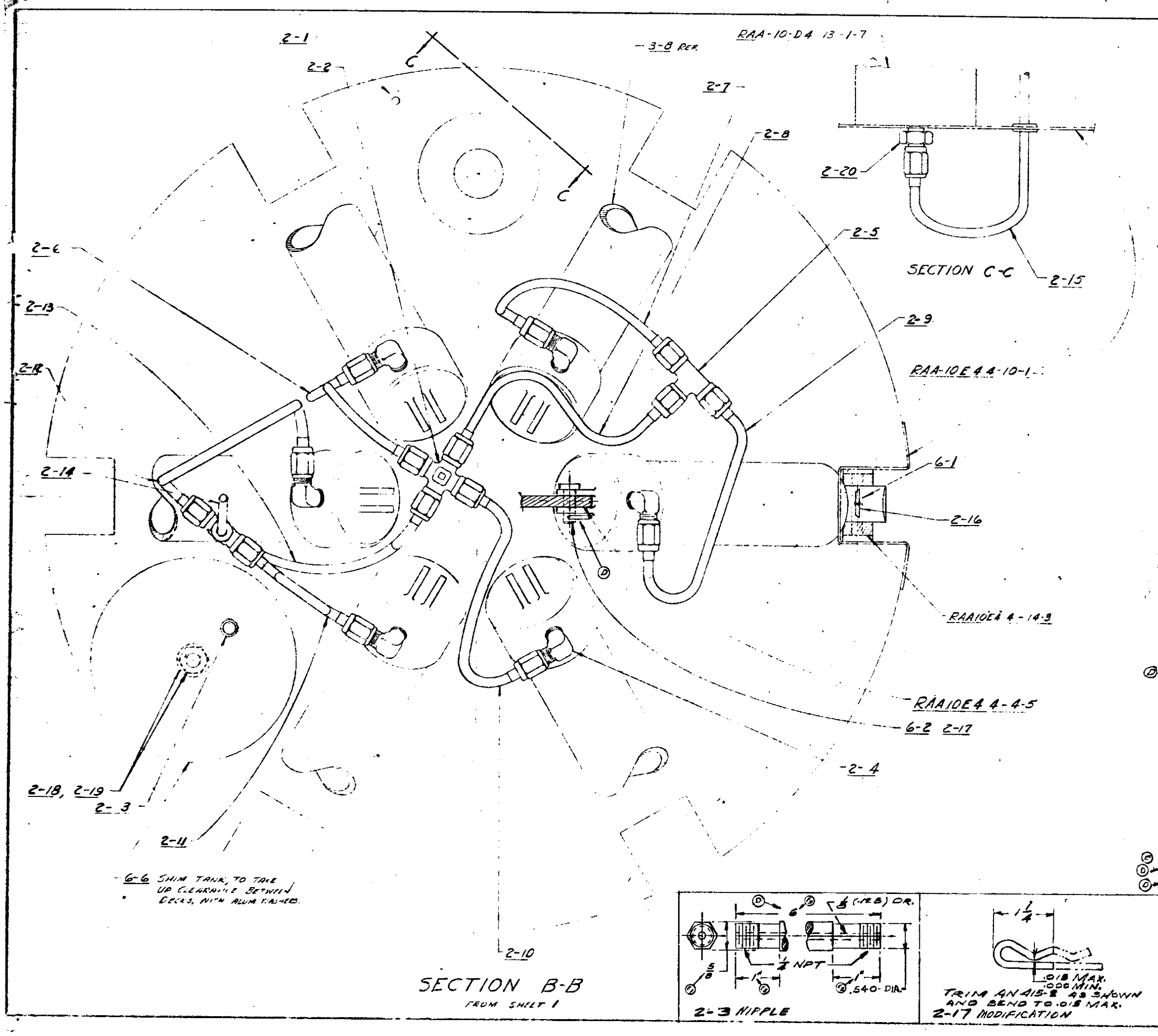
U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
CODE 405 D PROJ. 5D1

RAA 10 D 4 6

SHEET 1 OF 9 ALT D

SHEET 23 OF 81 1-3-56

N.R.L. DWG. NO. D2573



REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
B	CHANGED TOTAL OF 2-4 IN BILL OF MAT'L	12-9-50	J.E.H.
D	CHANGED PT.# 2-17 FROM 3/32 COTTER PIN TO AN 415-2 COWLING LOCK PIN & ADDED GAS NOTE, ALSO PT.# 2-3 WAS 3" IS NOW 5" LG.	1-22-52	
D1	ADDED ANODIZE AND CAD. PLATE	2-15-56	
E	PT. 2-3 E1 CHANGED FROM ROUND BAR TO HEX BAR. E2 DIM. ADDED, E3 & WAS 5		
E	PT. 2-4 9 WAS 10 REQ'D.	3-22-56	D.C.C.

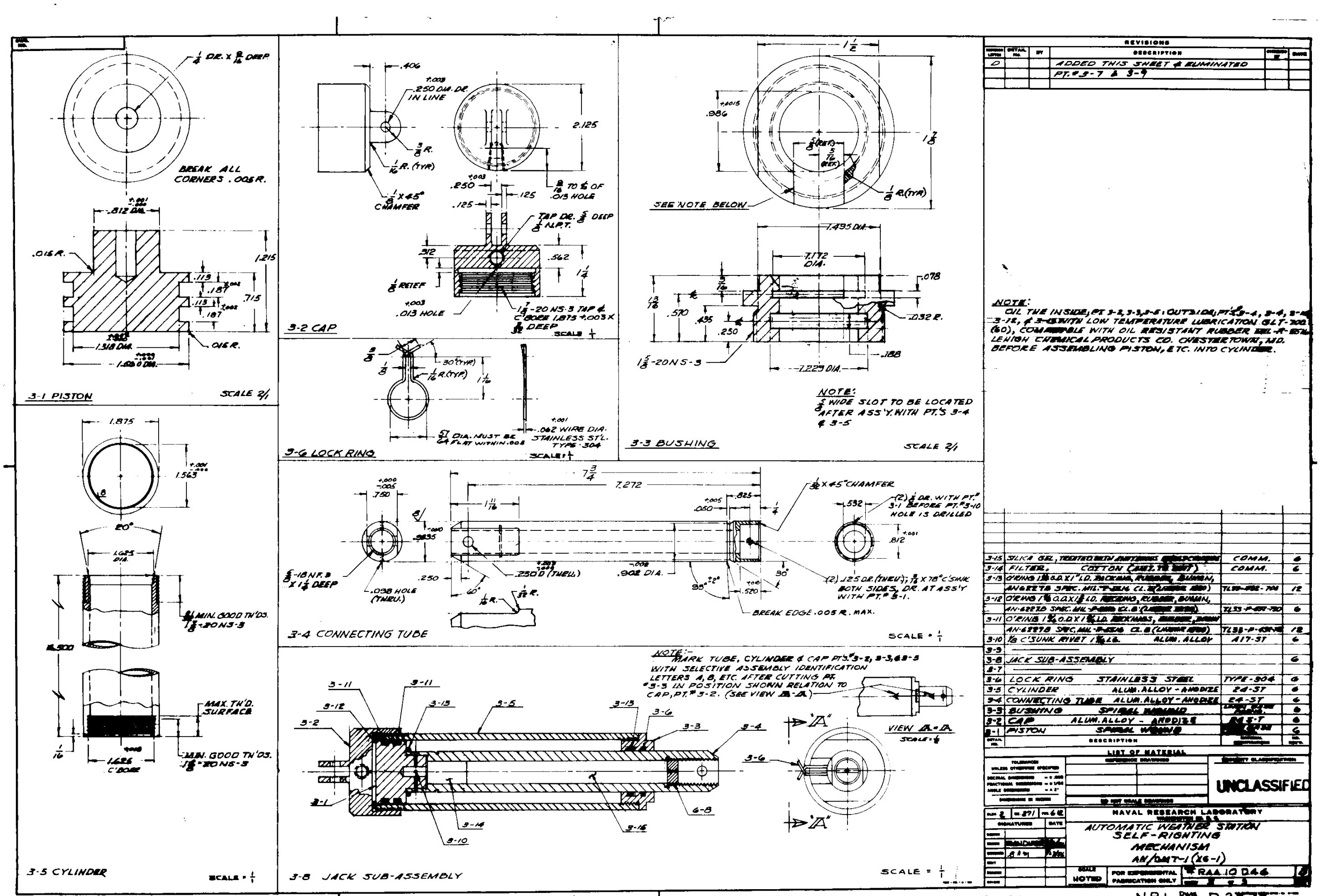
NOTES:
1. NO GAS LEAKS.
2. FILL SYSTEM WITH NITROGEN OR HELIUM GAS ONLY

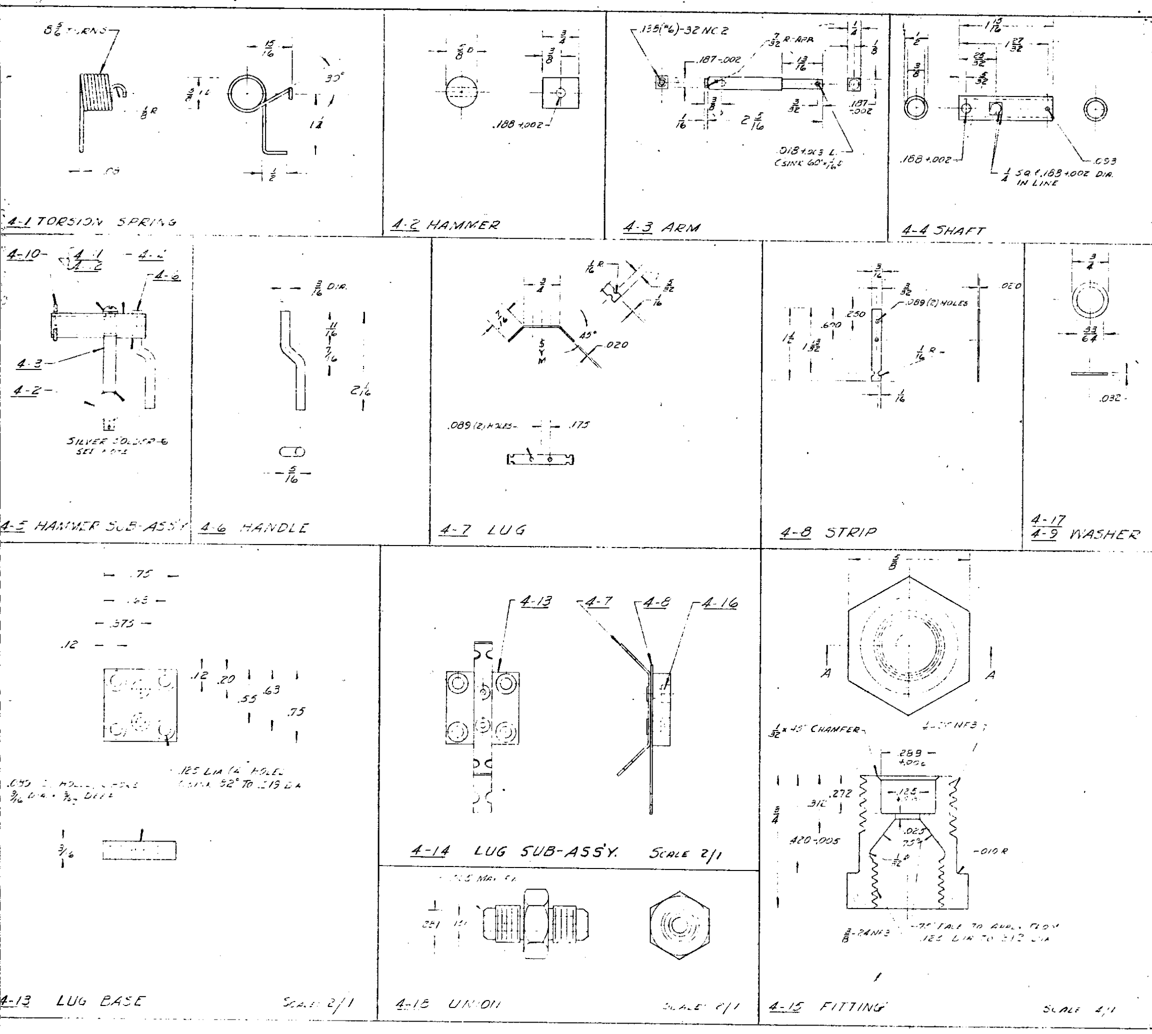
REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	FINISH
1	2-20	UNION AN815-3D	ALUM		
2	2-19	3/8 LOCK WASHER	STEEL		CAD. PL.
2	2-18	3/8-16 x 9/16 HEX.HD. BOLT	STEEL		CAD. PL.
REF.	RAA10E4 4-4-5	STRUCTURE FITTING			
REF.	RAA10E4 4-14-3	LEG FITTING			
REF.	RAA10D4 13-1-7	ANTENNA BASE SUB-ASSY.			
REF.	RAA10E4 4-10-1	LOWER DECK SUB-ASSY.			
	6-2	PIN			
	3-8	JACK SUB-ASSY.			
	6-1	PIN			
	6-6	TANK			
6	2-17	COWLING LOCK PIN AN 415-2	STAINLESS STEEL	(SEE MODIFICATION)	
6	2-16	1/16 x 1 3/4 COTTER	STEEL		
1	2-15	TUBE			
1	2-14	TUBE	LENGTH TO SUIT		
1	2-13	TUBE	3/16 DIA. x .035		
1	2-12	TUBE	FLARE TUBE (ALUM.	52S-0)	
1	2-11	TUBE	ENDS AS PER		
1	2-10	TUBE	DWG # AND [illegible]		
1	2-9	TUBE			
1	2-8	TUBE			
1	2-7	TUBE			
1	2-6	TUBE			
2	2-5	TEE AN 824-3D	ALUM	24S-T	
9	2-4	ELBOW-AN 822-3D	ALUM	24S-T	
1	2-3	NIPPLE	ALUM	24S-T	ANODIZE
2	2-2	CROSS-AN827-3D	ALUM	24S-T	
3	2-1	GROMMET AN-931-3-5	RUBBER		

LIST OF MATERIAL (QUANTITIES ARE FOR ONE UNIT)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ON FRACTIONS ± 1/64" ON DECIMALS ± .005" ON ANGLES ± ½°	DATE 5-17-50	AUTOMATIC WEATHER STA. SELF-RIGHTING MECHANISM AN/GMT-1(XG-1)	U. S. NAVY ELECTRONICS LABORATORY SAN DIEGO 52, CALIFORNIA
		SCALE 1/1	CODE 408 D NO. 5 D1
			RAA 10 D 4 6
			SHEET 2 OF 9 ALT E

SHEET 24 OF 61 1-3-58 N.R.L. DWG. NO. D2573


3-1 PISTON
SCALE 2/1
BREAK ALL CORNERS .005 R.
3-2 CAP
SCALE 1/1
3-3 BUSHING
SCALE 2/1
SEE NOTE BELOW
NOTE: 1/8 WIDE SLOT TO BE LOCATED AFTER ASS'Y. WITH PT.'S 3-4 & 3-5
3-6 LOCK RING
.062 WIRE DIA. STAINLESS ST'L. TYPE 304
3-4 CONNECTING TUBE
SCALE = 1/1
BREAK EDGE .005 R. MAX.
3-5 CYLINDER
SCALE = 1/1
MAX. TH'D. SURFACE
3-8 JACK SUB-ASSEMBLY
SCALE = 1/1
VIEW A-A
REVISIONS
ADDED THIS SHEET & ELIMINATED PT.# 3-7 & 3-9
NOTE:
OIL THE INSIDE; PT 3-2, 3-3, 3-5 : OUTSIDE; PT'S 3-1, 3-4, 3-6, 3-12, & 3-13 WITH LOW TEMPERATURE LUBRICATION GLT-200 (60), COMPATIBLE WITH OIL RESISTANT RUBBER, LEHIGH CHEMICAL PRODUCTS CO. CHESTERTOWN, MD. BEFORE ASSEMBLING PISTON, ETC. INTO CYLINDER.
3-15 SILICA GEL — COMM. — 6
3-14 FILTER, COTTON — COMM. — 6
3-13 O'RING — 12
3-12 O'RING — 6
3-11 O'RING — 12
3-10 1/8 C'SUNK RIVET — ALUM. ALLOY — A17-ST — 6
3-9
3-8 JACK SUB-ASSEMBLY — 6
3-7
3-6 LOCK RING — STAINLESS STEEL — TYPE-304 — 6
3-5 CYLINDER — ALUM. ALLOY - ANODIZE — 24-ST — 6
3-4 CONNECTING TUBE — ALUM. ALLOY - ANODIZE — 24-ST — 6
3-3 BUSHING — 6
3-2 CAP — ALUM. ALLOY - ANODIZE — 6
3-1 PISTON — 6
DESCRIPTION
LIST OF MATERIAL
UNCLASSIFIED
NAVAL RESEARCH LABORATORY
AUTOMATIC WEATHER STATION
SELF-RIGHTING
MECHANISM
AN/DMT-1 (XG-1)
SCALE NOTED
FOR EXPERIMENTAL FABRICATION ONLY
RAA 10 D46
SHEET 25 OF 81
1-3-56
N.R.L. DWG. NO. D2573



SYM	REVISIONS DESCRIPTION	DATE	APPROVAL
D	ADDED ANODIZE AND CAD. PL.	[illegible]	[illegible]

NOTE:
1. SOLDER 4-2 TO 4-3 USING HANDY AND HARMON NO. 1475 BT HARD SOLDER OR EQUIVALENT, THAT FLOWS AT 1450°F BUT IS FIRM ENOUGH TO QUENCH AT 1400°F.
2. ASSEMBLE 4-2 & 4-3 WITH PROPER AMOUNT OF SOLDER AT POINT TO BE BONDED, AND BRING ASSEMBLY UP TO 1450°F IN A MUFFLE FURNACE. ALLOW FURNACE TO COOL TO 1400°F THEN QUENCH ASSEMBLY IN ROOM TEMPERATURE WATER VERY QUICKLY. UNIT CAN THEN BE HEAT TREATED AT 600°F FOR 3 HOURS TO ATTAIN MAXIMUM HARDNESS OF ROCKWELL C-33 MINIMUM.

REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	UNIT WT	ZONE	
2	4-18	UNION AN815-3D	ALUM.	ALTERED			
2	4-17	WASHER	AL ALLOY	ALCOA 24S-T4	ANODIZE		D
4	4-16	#2268 TUBE RIVET	BRASS	.068 DIA. × 3/16 LG			
2	4-15	FITTING	AL. ALLOY	ALCOA 24S-T4	ANODIZE		D
2	4-14	LUG SUB-ASS'Y					
2	4-13	LUG BASE	PAPER BASE PHENOLIC				
2	4-12	#5 LOCK WASHER	BRASS		CAD. PL.		D
2	4-11	5-40 × 5/16 LG. RD. HD.	BRASS		CAD. PL.		D
2	4-10	COTTER PIN 1/16 × 1	BRASS				
1	4-9	WASHER	AL. ALLOY	ALCOA 52S-O	ANODIZE		D
2	4-8	STRIP	BRASS		CAD. PL.		D
2	4-7	LUG	BRASS	SPRING TYPE	CAD. PL.		D
2	4-6	HANDLE	BRASS		CAD. PL.		D
2	4-5	HAMMER SUB-ASS'Y.					
2	4-4	SHAFT	BRASS		CAD. PL.		D
2	4-3	ARM	BRASS		CAD. PL.		D
2	4-2	HAMMER	COPPER BERYLLIUM		CAD. PL.		D
2	4-1	TORSION SPRING	PH. BRONZE HD. DRAWN		CAD. PL.		D

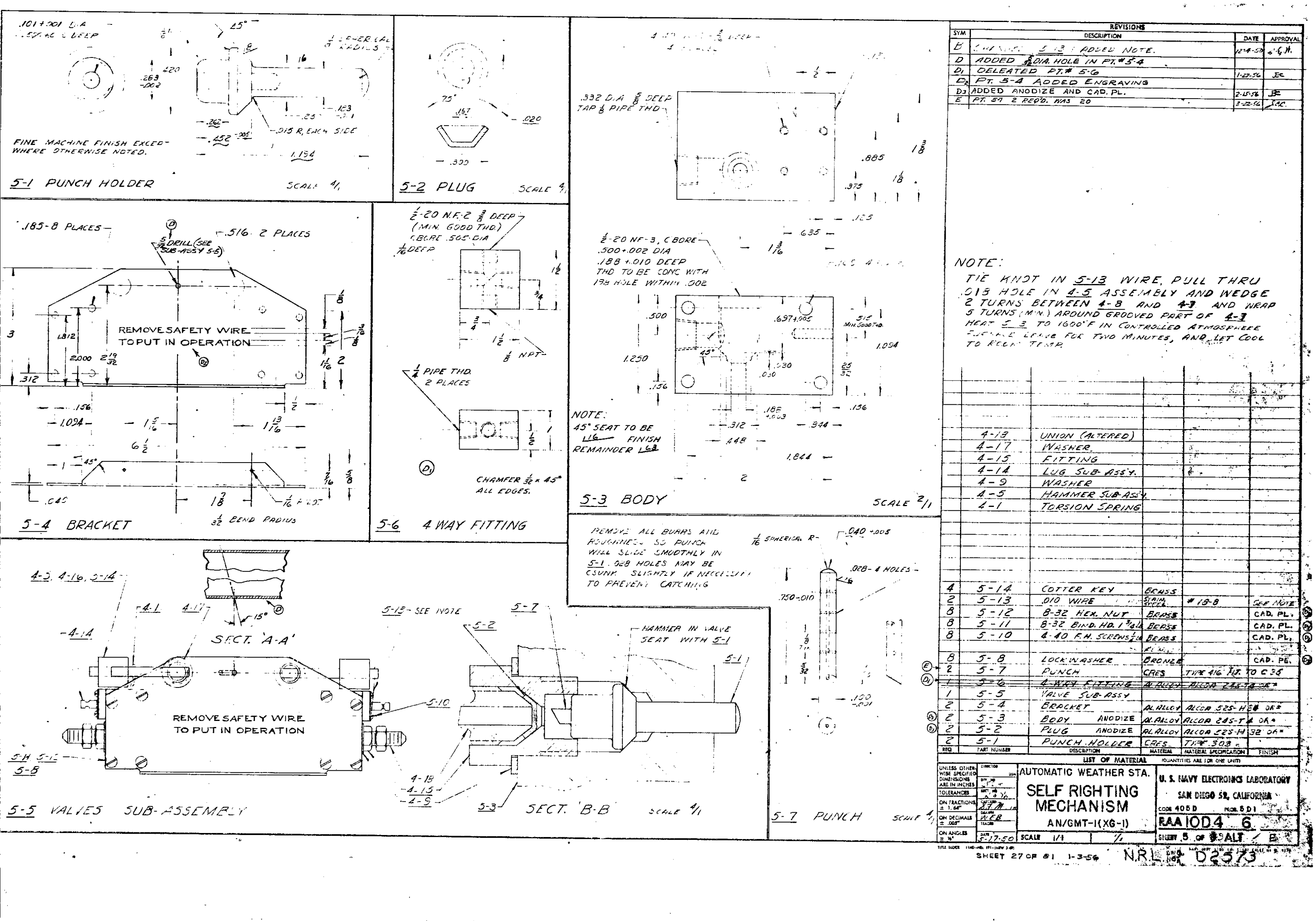
LIST OF MATERIAL

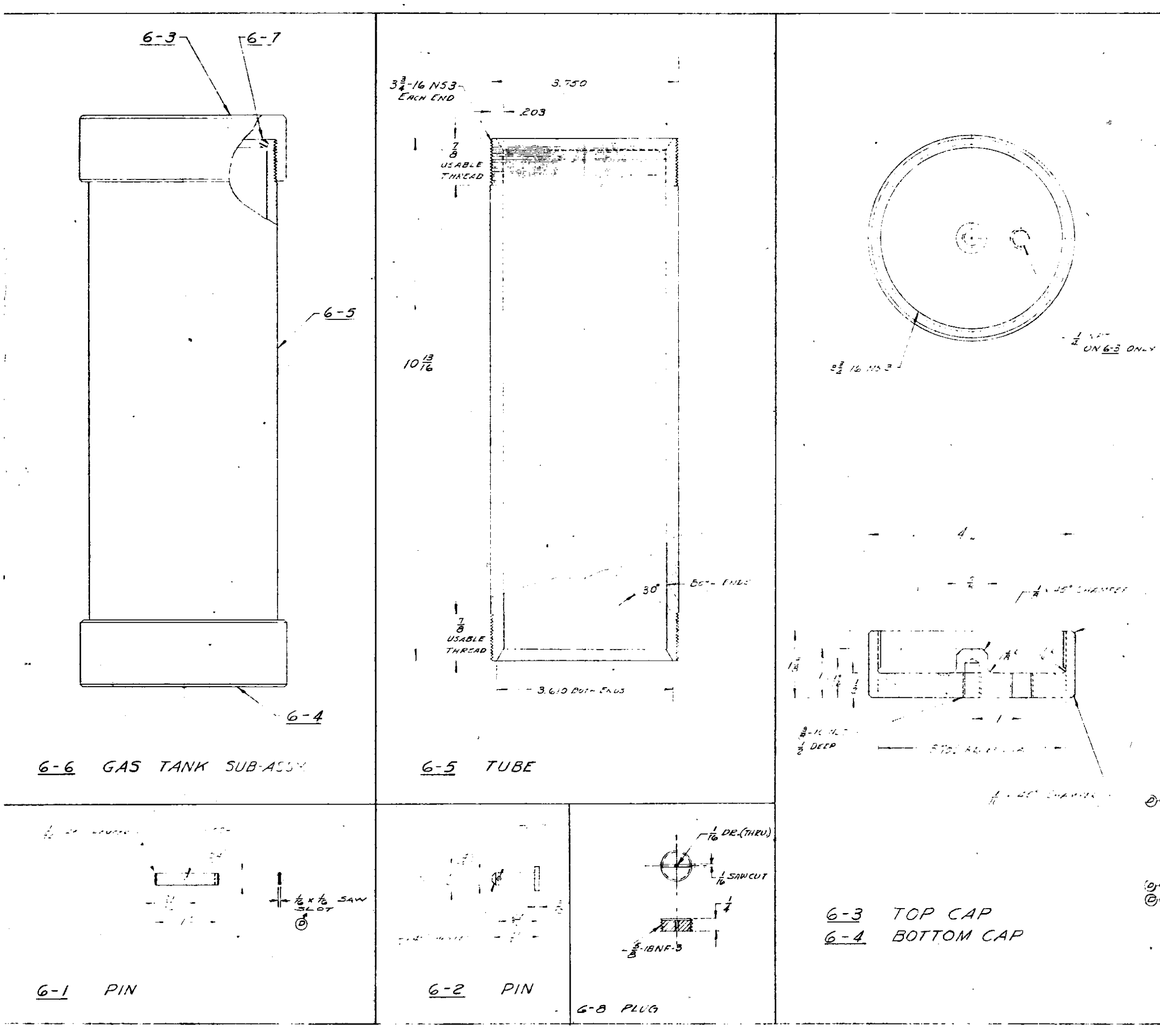
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
ON FRACTIONS ± 1/64"
ON DECIMALS ± .005"
ON ANGLES ± ½°
DATE 3-3-50

AUTOMATIC WEATHER STA.
SELF RIGHTING MECHANISM
AN/GMT-1(XG-1)
SCALE 1/1 & AS NOTED

U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
CODE 405D PROB 5D1
RAA 1004.6
SHEET 4 OF 9 ALT D

SHEET 26 OF 81 1-3-56 N.R.L. DWG. NO. D2573


5-1 PUNCH HOLDER
FINE MACHINE FINISH EXCEPT WHERE OTHERWISE NOTED.
5-2 PLUG
5-3 BODY
SCALE 2/1
5-4 BRACKET
REMOVE SAFETY WIRE TO PUT IN OPERATION
5-6 4 WAY FITTING
CHAMFER 1/32 x 45° ALL EDGES.
NOTE:
45° SEAT TO BE 16 FINISH REMAINDER 63
REMOVE ALL BURRS AND ROUGHNESS SO PUNCH WILL SLIDE SMOOTHLY IN 5-1. .028 HOLES MAY BE CSUNK SLIGHTLY IF NECESSARY TO PREVENT CATCHING
SECT. 'A-A'
HAMMER IN VALVE SEAT WITH 5-1
5-5 VALVES SUB-ASSEMBLY
SECT. 'B-B'
5-7 PUNCH
NOTE:
TIE KNOT IN 5-13 WIRE, PULL THRU .018 HOLE IN 4-5 ASSEMBLY AND WEDGE 2 TURNS BETWEEN 4-8 AND 4-3 AND WRAP 5 TURNS (MIN.) AROUND GROOVED PART OF 4-3
HEAT 5-3 TO 1600°F IN CONTROLLED ATMOSPHERE FURNACE LEAVE FOR TWO MINUTES, AND LET COOL TO ROOM TEMP.
REVISIONS
D ADDED 1/8 DIA. HOLE IN PT. # 5-4
D1 DELEATED PT. # 5-6
D2 PT. 5-4 ADDED ENGRAVING
D3 ADDED ANODIZE AND CAD. PL.
4-18 UNION (ALTERED)
4-17 WASHER
4-15 FITTING
4-14 LUG SUB-ASSY.
4-9 WASHER
4-5 HAMMER SUB-ASSY.
4-1 TORSION SPRING
5-14 COTTER KEY
5-13 .010 WIRE
5-12 8-32 HEX. NUT
5-11 8-32 BIND. HD.
5-10 4-40 F.H. SCREWS
5-8 LOCKWASHER
5-7 PUNCH
5-6 4-WAY FITTING
5-5 VALVE SUB-ASSY
5-4 BRACKET
5-3 BODY ANODIZE
5-2 PLUG ANODIZE
5-1 PUNCH HOLDER
LIST OF MATERIAL
AUTOMATIC WEATHER STA.
SELF RIGHTING MECHANISM
AN/GMT-1(XG-1)
U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
RAA 10D4 6
SHEET 27 OF 81 1-3-56
NRL D2573



REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
D	CHANGED PT'S. #6-1 & -6-2 FROM AL. ALLOY TO STAINLESS STEEL AND ADDED PT. #6-8		
	ADDED 1/16 SLOT IN PT 6-1	1-27-56	
D1	ADDED ANODIZE	2-15-56	

NOTE:
FILL 6-6 WITH HYDRAULIC OIL AND PROOF TEST TO 2,000 PSI. CHECK O.D. OF TUBE AND FLATNESS OF ENDS AFTER PRESSURE IS RELEASED TO INDICATE ANY YIELDING OF MATERIAL. REMOVE OIL.

REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	FINISH
6	6-8	PLUG	AL. ALLOY	24S-T4	ANODIZE
2	[illegible]	[illegible]	[illegible]	AN-HH-P-1196	
1	[illegible]	[illegible]	[illegible]	24S-T4	ANODIZE
	[illegible]	[illegible]	[illegible]	24S-T4	ANODIZE
1	[illegible]	[illegible]	[illegible]	24S-T4	ANODIZE

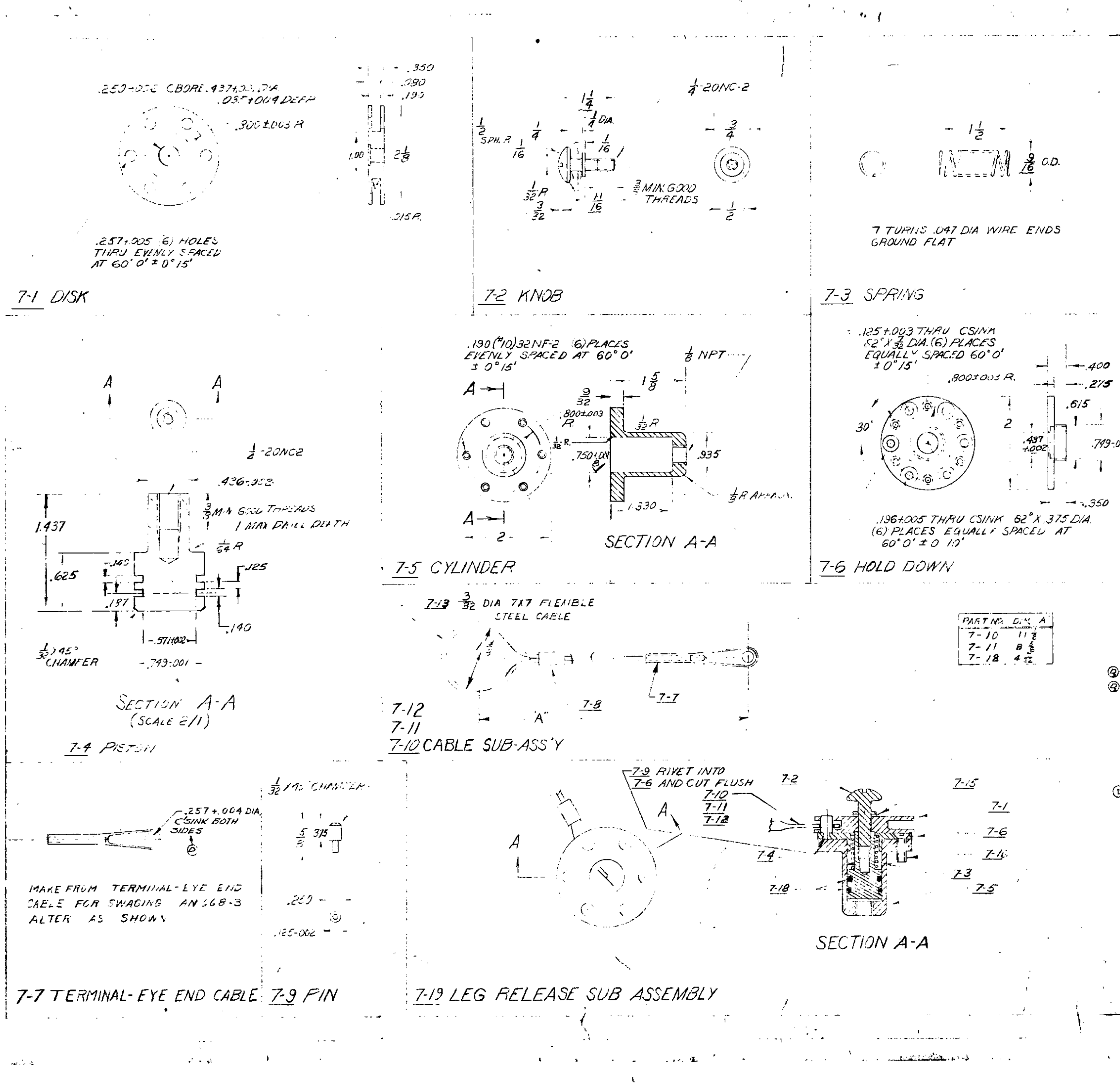
LIST OF MATERIAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
ON FRACTIONS ± 1/64"
ON DECIMALS ± .005"
ON ANGLES

AUTOMATIC WEATHER STA.
SELF RIGHTING MECHANISM
AN/GMT-1(XG-1)
SCALE 1/1

U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
CODE 405 PROB 5D1
RAA 10 D4 6
SHEET 6 OF 9 ALT

SHEET 28 OF 81 1-3-56 N.R.L. DWG. NO. D2573



REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
D	REDESIGNED PTS. # 7-4, 7-5, 7-8, 7-7 & 7-12		
D	ADDED C'SINK ON PT. 7-7		
D	LIST OF MAT. (A) PT. 7-5 WAS ALUM. ALLOY A 17S-T (D2) DELETED	1-27-56	
	PT 7-17 (D3) MAT. SPEC. WAS AN HH-P114b (D4) ADDED ANODIZE & CAD. PL.	2-15-56	
D	REVISED NOTE 2		

NOTES:

1.) 7-13 TO BE EQUIVALENT TO STA-KON #D8-14 AS MADE BY THOMAS & BETTS CO.

2.) SATURATE 7-18 OIL INSIDE OF 7-5 AND OUT SIDE OF 7-4 WITH LOW TEMPERATURE LUBRICANT GLT-700-(60) COMPATIBLE WITH OIL RESISTANT RUBBER MIL-R-5516 LEHIGH CHEMICAL PRODUCTS CO. CHESTERTOWN, MD.

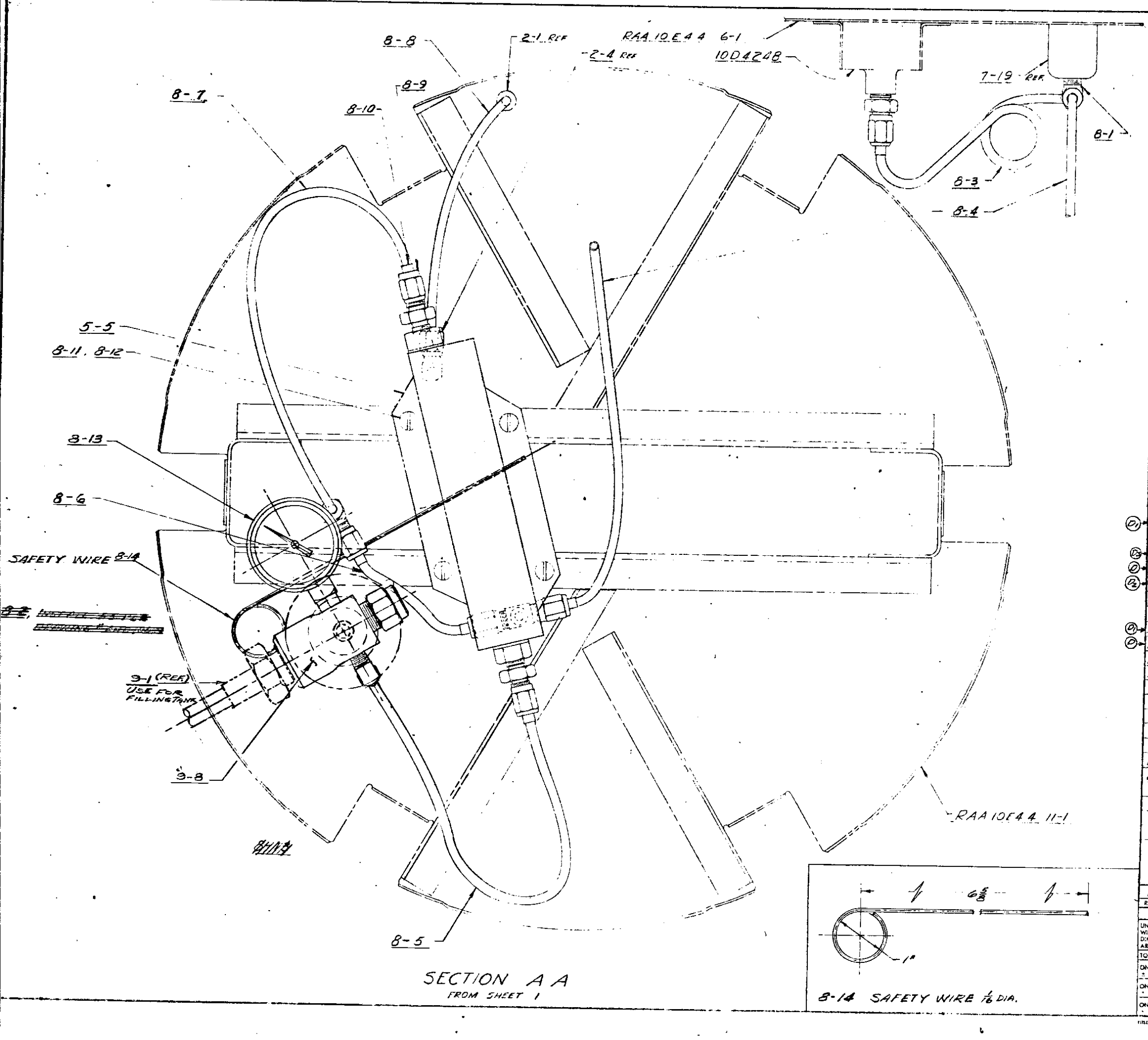
3.) 7-8 NICOPRESS OVAL SPLICING SLEEVE IS MANUFACTURED BY NATIONAL TELEPHONE SUPPLY CO.

LIST OF MATERIAL

REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	UNIT WT	ZONE
1	7-19	LEG RELEASE SUB-ASSY				
2	7-18	3/4 OD x 9/16 ID "O" RING	RUBBER	7L33-P-492-060		
~~1~~	~~7-17~~	~~FELT~~	~~FELT~~			
6	7-16	10-32 FHMS 5/8 LONG	BRASS			
1	7-15	[illegible] WASHER 1/4 ID	[illegible]			
6	7-13	CABLE 3/32 DIA	CRES			
2	7-12	CABLE SUB-ASSEMBLY				
2	7-11	CABLE SUB-ASSEMBLY				
2	7-10	CABLE SUB-ASSEMBLY				
6	7-9	PIN	STAINLESS STEEL	TYPE 304		
6	7-8	FITTING-COPPER NICOPRESS SLEEVE		28-2-G		
6	7-7	TERMINAL-EYE END CABLE	STEEL	AN 668-3 (ALTERED)	CAD.	
1	7-6	HOLD DOWN	AL ALLOY	24S-T4	ANODIZE	
1	7-5	CYLINDER	AL ALLOY	24S-T4	ANODIZE	
1	7-4	PISTON	PHENOLIC	LINEN BASE		
1	7-3	SPRING	STEEL	MUSIC WIRE	CAD. PL.	
1	7-2	KNOB	AL ALLOY	24S-T4	ANODIZE	
1	7-1	DISK	AL ALLOY	24S-T4	ANODIZE	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	DIV. HD.	AUTOMATIC WEATHER STA SELF-RIGHTING MECHANISM AN/GMT-1(XG-1)	U. S. NAVY ELECTRONICS LABORATORY SAN DIEGO 52, CALIFORNIA
TOLERANCES	SECT. HD.		CODE 405D PROJ. 8D3
ON FRACTIONS ± 1/64"	CHECKED L. S. S.		RAA10D4
ON DECIMALS ± .005"	DRAWN S. MORAN		
ON ANGLES ± ½°	DATE 31 JAN '50	SCALE 1/1	SHEET 7 OF 8 SALT D

SHEET 29 OF 81 1-3-56 N.R.L. DWG. NO. D2573



SYM	REVISIONS — DESCRIPTION	DATE	APPROVAL
B	CHANGED TOTAL OF 8-9 & 8-10. CHANGED 8-9 TO ALUMINUM BRONZE.	12-4-50	
D	ADDED SAFETY WIRE PT.# 8-14		
D1	DELETED		
D2	CHANGED FROM 2¾ DIA. TO 2" DIA., OF PT.# 8-13		
D3	ADDED PT.# 9-8 & 9-1 & NOTE		
D4	ADDED CAD. PL.	2-15-56	

NOTE:
FILL SYSTEM WITH NITROGEN OR HELIUM GAS ONLY.

REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	FINISH
	~~5-6~~	~~AIR [illegible]~~			
1	9-8	MODIF. OF FILLER VALVE			
1	8-14	SAFETY WIRE 1/16 DIA.	STEEL		CAD. PL.
1	8-13	GAGE 2" MAX. DIA.	1500 PSI	BOURDEN TUBE TYPE	
~~REF~~	~~[illegible]~~	~~HIGH PRESSURE AIR [illegible]~~			
REF.	RAA10E44 6-1	UPPER DECK			
REF	RAA10E44 11-1	MIDDLE DECK			
REF.	RAA10D4 Z4B	POST RELEASE			
	5-5	VALVE SUB-ASSY			
	2-1	GROMMET			
	7-19	LEG RELEASE			
4	8-12	WASHER AN936-A8-	STEEL		CAD. PL.
4	8-11	8-32 BINDER HD. ⅜ LG.	STEEL		CAD. PL.
29	8-10	SLEEVE AN819-3Z	ALUM. BRONZE		
29	8-9	NUT AN818-3D			
1	8-8	TUBE			
1	8-7	TUBE LENGTH TO SUIT			
1	8-6	TUBE 3/16 O.D. x .035			
1	8-5	TUBE FLARE TUBE	ALUM.	52S-O	
1	8-4	TUBE ENDS AS PER			
1	8-3	TUBE DWG "AND 10061			
1	8-2	VALVE AN6287-1			
2	8-1	TEE AN825-3D	ALUM		

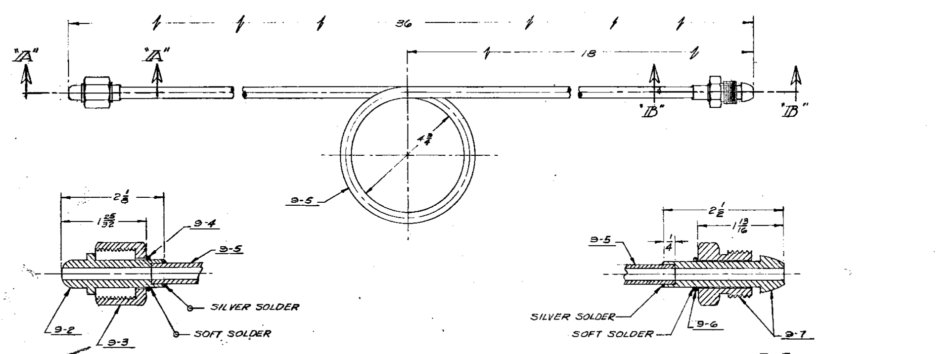
LIST OF MATERIAL (QUANTITIES ARE FOR ONE UNIT)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES: ON FRACTIONS ± 1/64"; ON DECIMALS ± .005"; ON ANGLES	DIRECTOR / DIV. NO. / SECT. NO. / CHECKED / DRAWN / TRACED / DATE	AUTOMATIC WEATHER STA. SELF-RIGHTING MECHANISM AN/GMT-1(XG-1)	U. S. NAVY ELECTRONICS LABORATORY SAN DIEGO 52, CALIFORNIA. CODE 405 D PROJ. 5D1
		SCALE 1/1	RAA 10 D 4 6 — SHEET 8 OF 9 ALT D

SHEET 30 OF 81 1-3-56 N.R.L. DWG. NO. D2573

DWG. NO. RAA 10D 4-6

REVISION LETTER	DETAIL NO.	BY	DESCRIPTION	CHECKED BY	DATE
D		J.E.S.	THIS SHEET ADDED		



SECTION "A"-"A"
SCALE = $\frac{1}{1}$

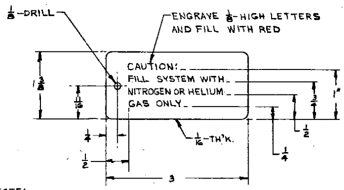
SECTION "B"-"B"
SCALE = $\frac{1}{1}$

9

9-1 SUB-ASSEMBLY

SCALE = $\frac{1}{2}$

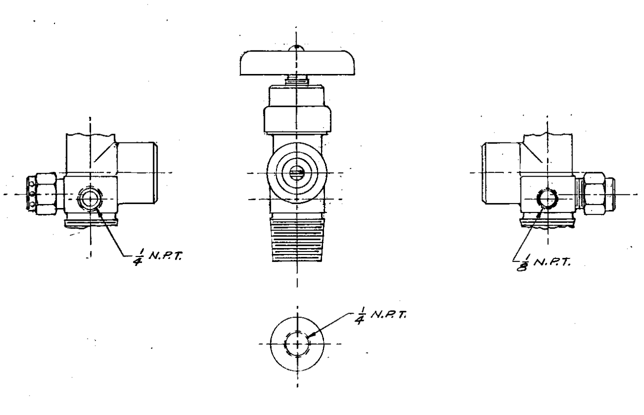
NOTE:
PT. # 9-9 TO BE USED AS A SPARE IN CASE COMPRESSED AIR FILLER TANK IS SUPPLIED WITH FEMALE OUTLET.



NOTE:
WIRE TO FILLER VALVE PT. 9-8

9-10 FILLER VALVE TAG

SCALE: $\frac{1}{1}$



9-8 MODIFICATION OF FILLER VALVE

SCALE = $\frac{1}{1}$

DETAIL NO.	DESCRIPTION	MATERIAL SPECIFICATIONS	NO. REQ'D.
9-10	FILLER VALVE TAG ALUM. ALLOY	5052-T4	1
9-9	ADAPTER NO. 19X04 LINDE AIR PROD. (SEE NOTE)		1
9-8	MODIF. OF FILLER VALVE		1
9-7	ADAPTER NO. 19X04 LINDE AIR PROD.	COMM.	1
9-6	$\frac{1}{16}$ O.D. X $\frac{5}{32}$ LG. COPPER WIRE	COMM.	1
9-5	$\frac{3}{16}$ O.D. X $\frac{1}{16}$ WALL X $53\frac{3}{16}$ LG. COPPER TUBING	COMM.	1
9-4	$\frac{1}{16}$ O.D. X $2\frac{3}{32}$ LG. COPPER WIRE	COMM.	1
9-3	B SIZE OXYGEN NUT # 803-0004	AIR REDUCTION SALES CO.	2
9-2	$\frac{1}{4}$ OXYGEN HOSE GLAND # 803-0008	AIR REDUCTION SALES CO.	1
9-1	SUB-ASSEMBLY		1

LIST OF MATERIAL

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL DIMENSIONS = ± .005
FRACTIONAL DIMENSIONS = ± 1/64
ANGLE DIMENSIONS = ± 2°
DIMENSIONS IN INCHES

REFERENCE DRAWINGS

DO NOT SCALE DRAWINGS

SECURITY CLASSIFICATION: UNCLASSIFIED

SUB. 2 — ER. 271 — PR. G12

NAVAL RESEARCH LABORATORY
WASHINGTON 25, D. C.

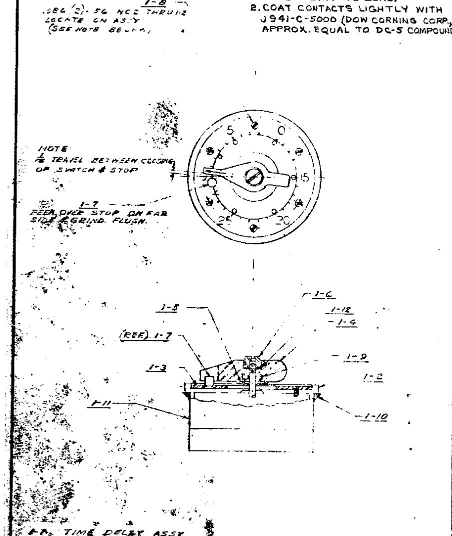
AUTOMATIC WEATHER STATION
SELF-RIGHTING MECHANISM

SIGNATURES		DATE
DESIGN		
DRAWN	SANDIFER	
CHECKED		1/17/56
UNIT		
BRANCH		
DIVISION		

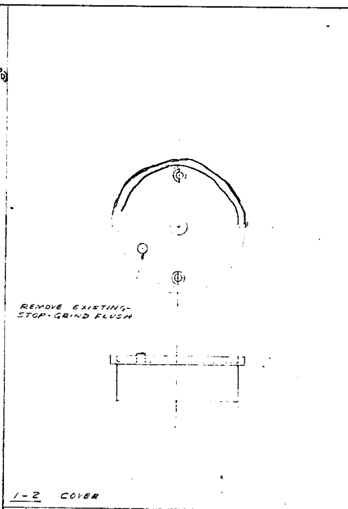
SCALE: NOTED — FOR EXPERIMENTAL FABRICATION ONLY — DWG. NO. RAA 10D 4-6 — D — SHEET 9 OF 9

SHEET 31 OF 81 1/8/56 N.R.L. DWG. NO. D 2573

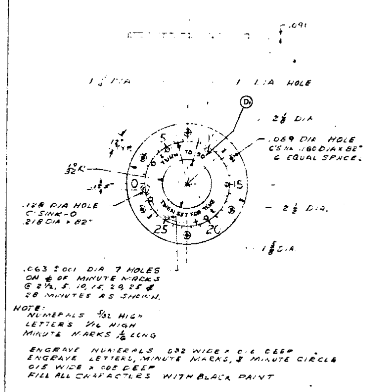
NOTES:
1. MAIN SPRING OF TIMER TO BE WOUND 1½ TO 2 TURNS WHEN HAND POINT TO ZERO.
2. COAT CONTACTS LIGHTLY WITH J941-C-5000 (DOW CORNING CORP., APPROX. EQUAL TO DC-5 COMPOUND)



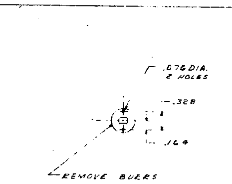
1-1 TIME DELAY ASSY



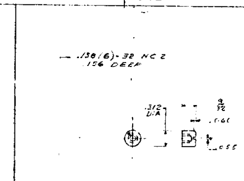
1-2 COVER



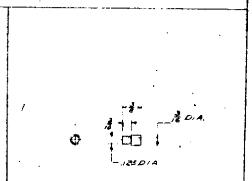
1-3 DIAL



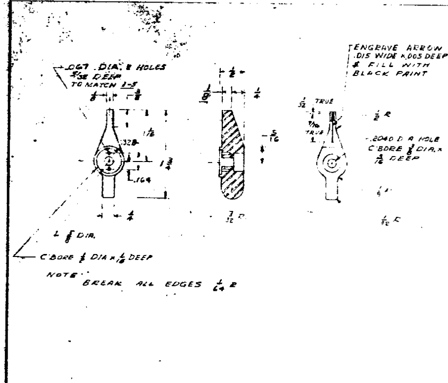
1-5 WASHER



1-6 CAP NUT



1-7 STOP



1-4 KNOB

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
B	CHANGED NOTE 3 TO "N-28 INSTRUMENT OIL.	12-6-56	
D1	PT. 1-3 ENGRAVING TO 30 WAS PAST 5	1-17-56	A.R.C.
D2	NOTE 3 ADDED LOW TEMP. INSTRUMENT OIL	1-17-56	ARC.
D3	PT. 1-1 ADDED NOTES		
D4	LIST OF MAT. ADDED CONTACT NOTE	2-15-56	

NOTE:
* 1. FURNISHED WITH 1-11 (TIME DELAY) BY RHODES CO.
2. 1-1 TO BE MADE FROM M.H. RHODES CO. "MARK TIME"
3. CLEAN WORKS OF 1-11 & OIL WITH ~~[illegible]~~ MIL-L-6085A LOW TEMP. INSTRUMENT OIL
4. ALL MACHINED SURFACES TO BE 63 UNLESS OTHERWISE INDICATED.

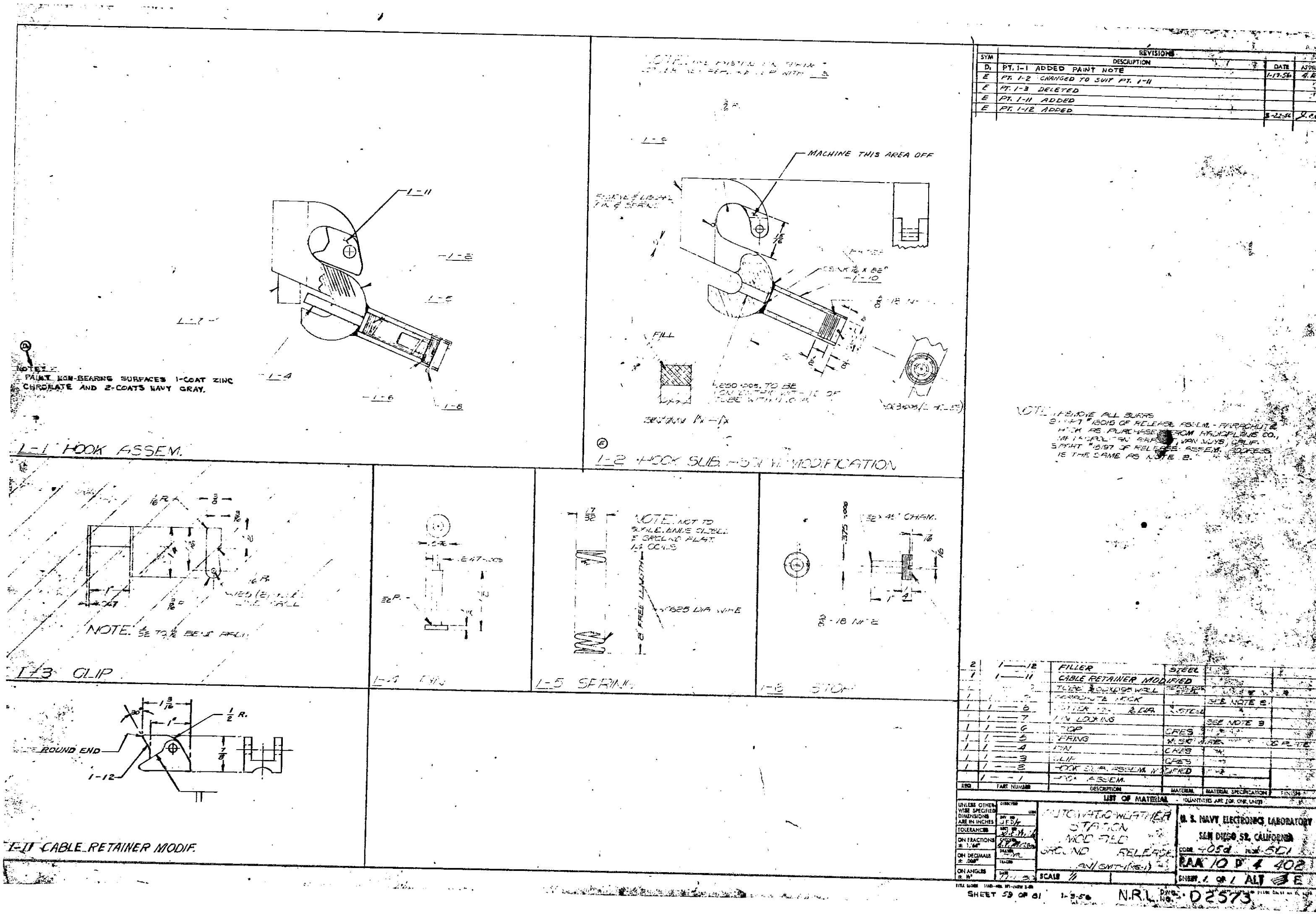
REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	FINISH
1	1-12	SPRING LOCK WASHER			
1	1-11	TIME DELAY	*		
1	1-10	CLAMP	*		
2	1-9	R.H. OR SCREW #2-56 × ⅛ LONG	STEEL		CAD. PLATE
6	1-8	F.H. MS 2-56 × 3/16 LONG	CRES		
1	1-7	STOP	CRES	MIL-S-853	
1	1-6	CAP NUT	CRES	MIL-S-853	
1	1-5	WASHER	*		
1	1-4	KNOB	CRES	MIL-S-853	
1	1-3	DIAL	CRES	MIL-S-853	
1	1-2	COVER	*		
1	1-1	TIME DELAY ASSEMBLY	0 TO 30 MIN.	CONTACTS CLOSED ON TIME OUT	

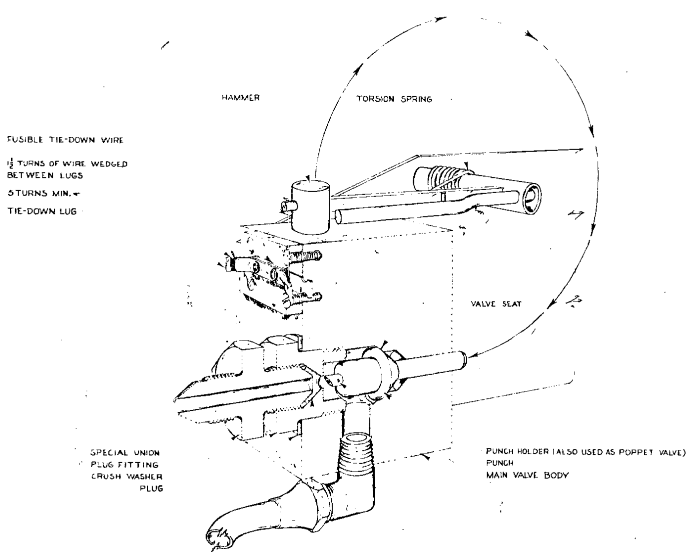
LIST OF MATERIAL — QUANTITIES ARE FOR ONE UNIT

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES; TOLERANCES ON FRACTIONS ± 1/64"; ON DECIMALS ± .005"; ON ANGLES ± ½°	DIRECTOR; DIV. HD. JED/T; SECT. HD. [illegible]; CHECKED R.K. [illegible]; DRAWN D.L. HICKS; TRACED; DATE 10-12-56	AUTOMATIC WEATHER STA ERECTION DELAY MECHANISM AN/GMT-(XG-1); SCALE 1	U. S. NAVY ELECTRONICS LABORATORY SAN DIEGO 52, CALIFORNIA; CODE 405 d PROB. 5D1; RAA 10 D 4 172; SHEET 1 OF 1 ALT D

SHEET 59 OF 81 1-8-56 N.R.L. DWG. NO. D2573

Sanitized Copy Approved for Release 2011/05/25 : CIA-RDP78-03642A001200050008-5


REVISIONS
SYM
DESCRIPTION
DATE
APPROV.
D
PT. 1-1 ADDED PAINT NOTE
E
PT. 1-2 CHANGED TO SUIT PT. 1-11
E
PT. 1-3 DELETED
E
PT. 1-11 ADDED
E
PT. 1-12 ADDED
MACHINE THIS AREA OFF
NOTES:
PAINT NON-BEARING SURFACES 1-COAT ZINC CHROMATE AND 2-COATS NAVY GRAY.
1-1 HOOK ASSEM.
1-2 HOOK SUB-ASSEM. MODIFICATION
1-3 CLIP
1-4 PIN
1-5 SPRING
1-6 STOP
ROUND END
1-12
1-11 CABLE RETAINER MODIF.
FILLER
CABLE RETAINER MODIFIED
STEEL
SEE NOTE B
PIN LOCKING
STOP
SPRING
PIN
CLIP
HOOK ASSEM.
DESCRIPTION
MATERIAL
MATERIAL SPECIFICATION
LIST OF MATERIAL
U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
SCALE
SHEET 59 OF 61
N.R.L. DWG. NO. D2573



REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	UNIT WT	ZONE

LIST OF MATERIAL

AUTOMATIC WEATHER STA.
PICTORIAL OF VALVE SELF RIGHTING MECHANISM
AN/GMT-1 (XG-1)

U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA

CODE 405a PROB 5D1

RAA 10 D 7 154

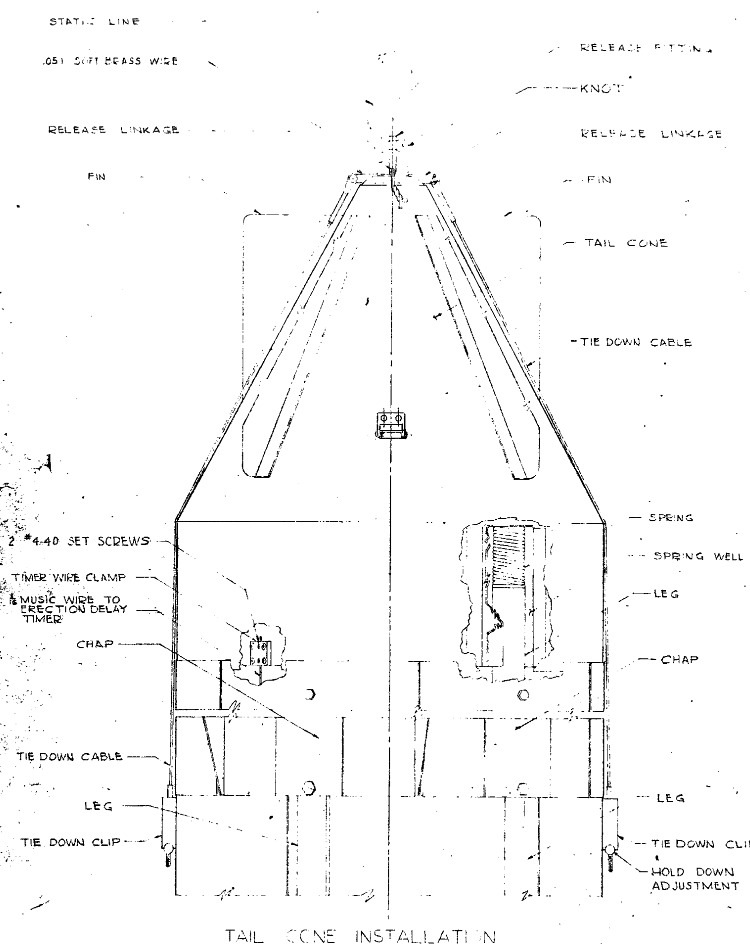
SHEET 1 OF 1 ALT A

SCALE

10 25 50

SHEET 64 OF 81 1-3-56 N.R.L. DWG. NO. D2573

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



TAIL CONE INSTALLATION

REF DWG RAA 10 E 44

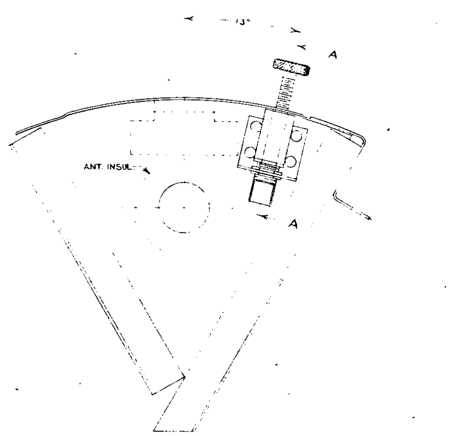
REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	FINISH

LIST OF MATERIAL (QUANTITIES ARE FOR ONE UNIT)

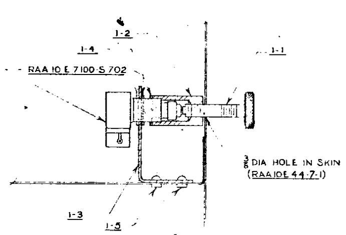
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	DIRECTOR	AUTOMATIC WEATHER STA.	U. S. NAVY ELECTRONICS LABORATORY
TOLERANCES		TAIL CONE INSTALL.	SAN DIEGO 52, CALIFORNIA
ON FRACTIONS ± 1/64"	CHECKED	(PICTORIAL)	CODE PROJ.
ON DECIMALS ± .005"	DRAWN D.L. HICKS	AN/SMT-1 (XG-1)	RAA 10 D 7 157
ON ANGLES ± ½°	DATE 10-30-53	SCALE ½	SHEET 1 OF 1 ALT A

SHEET 65 OF 81 1-3-56

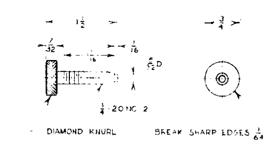
N.R.L. DWG. No. D2573



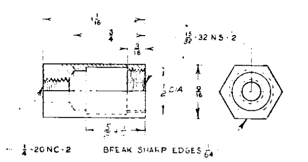
MIDDLE DECK VIEW DOWN
STRUCTURE
RAA10E44- 11-1 REF.



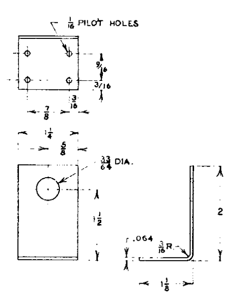
SECTION A-A



1-1 THUMB SCREW



1-2 SLEEVE SCALE 2/1



1-3 BRACKET

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
D1	ADDED ANODIZE AND CAD PL	2-14-56	JE

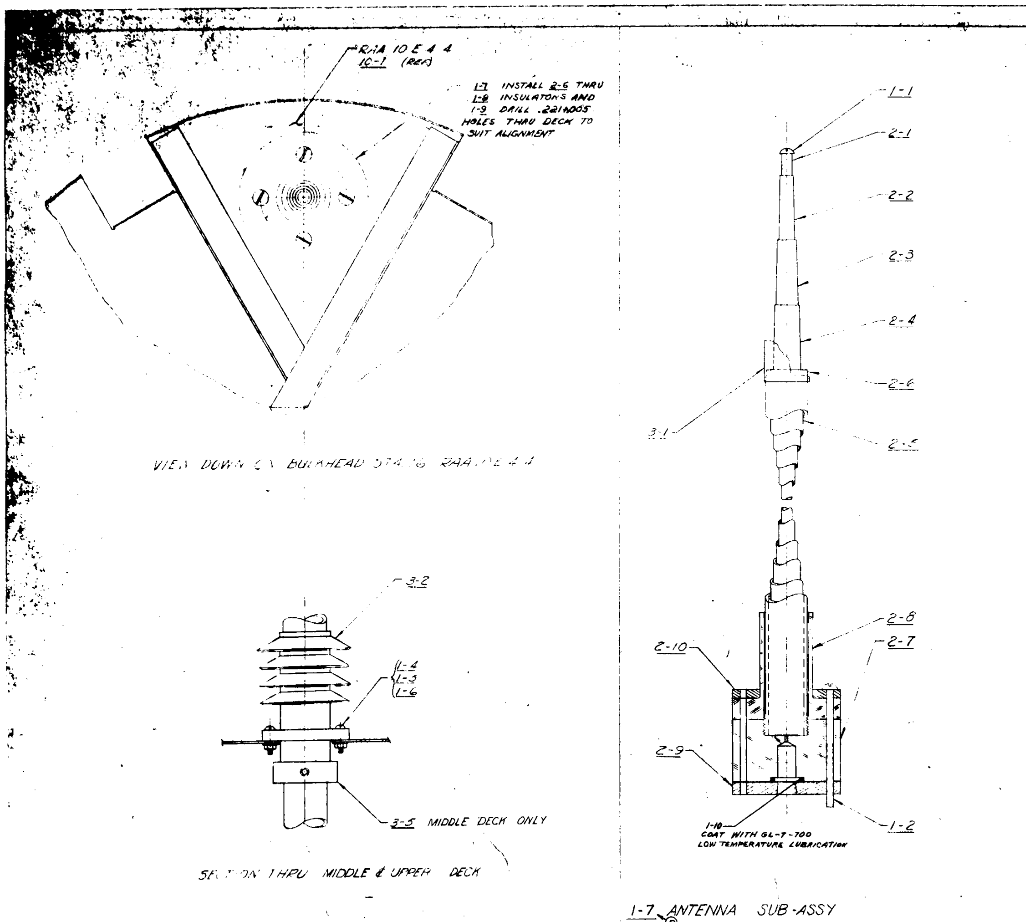
REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	FINISH	
REF.	RAA10E7100 S 702	SWITCH				
4	1-5	RIVET	ALUM. ALLOY	AN 430-AD 4		
3	1-4	LOCK NUT	BRASS	NICKEL PLATE		
1	1-3	BRACKET	ALUM. ALLOY	(.064) 24 S-T3	ANODIZE	D1
1	1-2	SLEEVE	ALUM ALLOY	24S-T4 ($\frac{9}{16}$ HEX.)	ANODIZE	D1
1	1-1	THUMB SCREW	BRASS		CAD. PL.	D1

LIST OF MATERIAL (QUANTITIES ARE FOR ONE UNIT)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	DIRECTOR; DIV HD. SFD	AUTOMATIC WEATHER STA. CUTOFF SWITCH INSTALLATION AN/GMT-1(XG-1)	U. S. NAVY ELECTRONICS LABORATORY SAN DIEGO 52, CALIFORNIA
TOLERANCES	SEC. HD.		CODE 405d PROB. 5D1
ON FRACTIONS ± 1/64"	CHECKED		RAA 24 D 7147
ON DECIMALS ± .005"	DRAWN B.H.Bos		
ON ANGLES ± ½°	TRACED; DATE 10-12-56	SCALE 1/1	SHEET 1 OF 1 ALT D

TITLE BLOCK

SHEET 66 OF 81 1-3-58 N.R.L. DWG. No. D2573



D	1-7	DWG [illegible]		
D	1-3	DELETED		
D	2-11	DELETED		
D	—	B/M REVISED TO SUIT CHANGES	1-23-56	[illegible]
D1	NOTE	DELETED		
D2	NOTE	CHANGED PERMATEX TO GLYPTAL		
D3	B.M.	ADDED CAD. PL.	2-14-56	[illegible]
E	B.M.	ADDED O-RING	3-22-56	[illegible]

NOTES:

~~[illegible]~~

(D2)—APPLY GLYPTAL TO THREADS ON 1-1 ON ASSY.

REQ	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPECIFICATION	UNIT WT	ZONE	
1	1-10	O-RING #1820-11 LINEAR INC.					(E)
4	1-9						
4	1-8						
1	1-7	ANT. SUB-ASSY					
	3-5	ANT. CONNECTOR ASSY.					
	3-2	INSULATOR					
	3-1	CAP SUB-ASSY					
	2-1	TUBE					
	~~2-11~~	~~NUT~~					(D)
	2-10	RING					
	2-9	PLATE					
	2-8	ANT. GUIDE					
	2-7	BODY					
	2-6	TUBE					
	2-5	TUBE					
	2-4	TUBE					
	2-3	TUBE					
	2-2	TUBE					
4	1-6	#4 [illegible] WASH.	BRASS	CAD. PL.			(D3)
4	1-5	#4 [illegible] HEX NUT	BRASS	CAD. PL.			(D3)
4	1-4	#4-40 [illegible] SCREW	BRASS	CAD. PL.			(D3)
~~[illegible]~~	~~1-3~~	~~[illegible]~~	~~[illegible]~~				(D)
4	1-2	#10 [illegible]	STEEL	CAD. PL.			(D3)
1	1-1	#10 SELF TAPPING SCREW	STEEL	CAD. PL.			(D3)

LIST OF MATERIAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
ON FRACTIONS ± 1/64"
ON DECIMALS ± .005"
ON ANGLES ± ½°

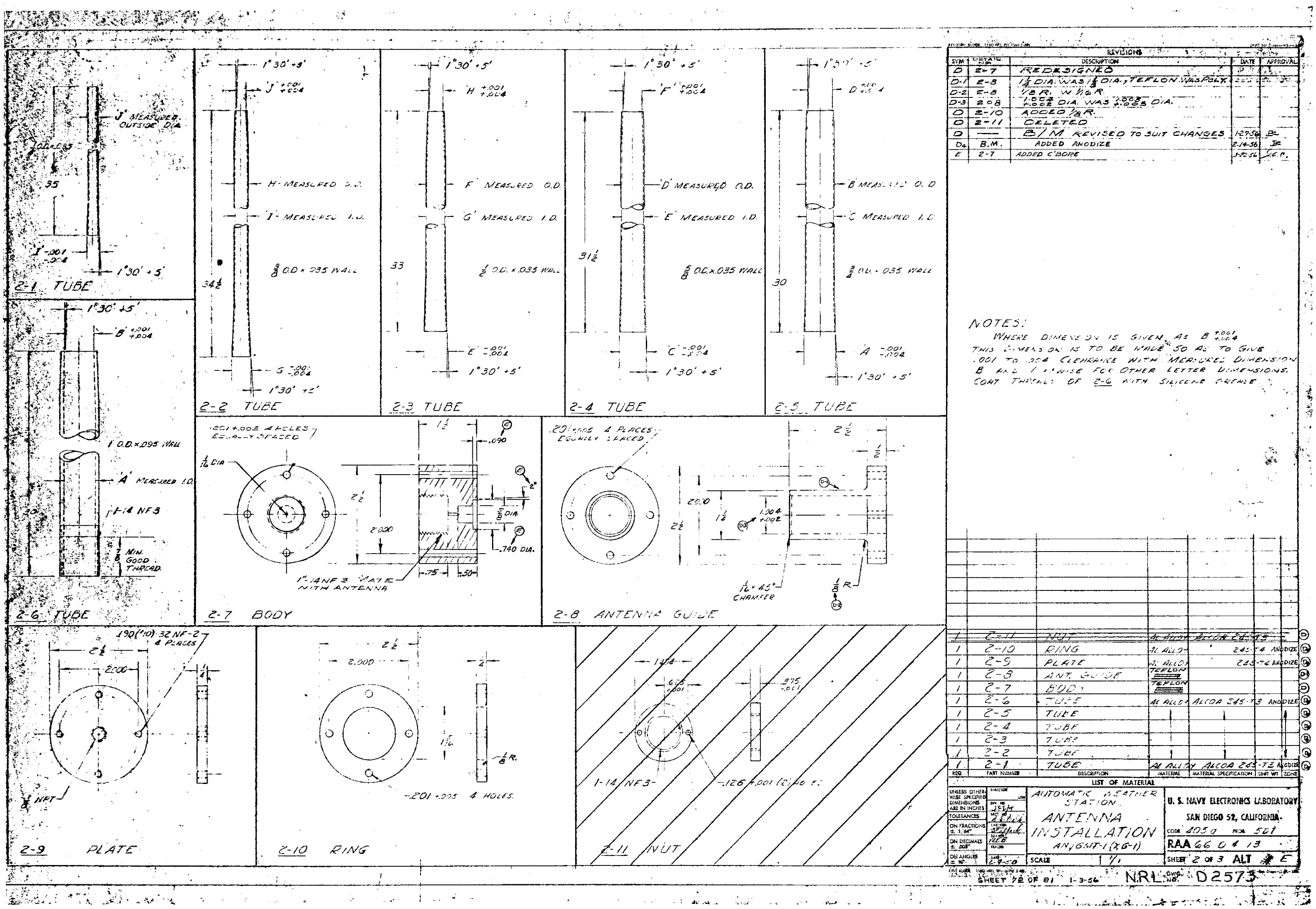
DIRECTOR
DIV. HD. [illegible]
SECT. HD. [illegible]
CHECKED [illegible]
DRAWN WEB
TRACED
DATE

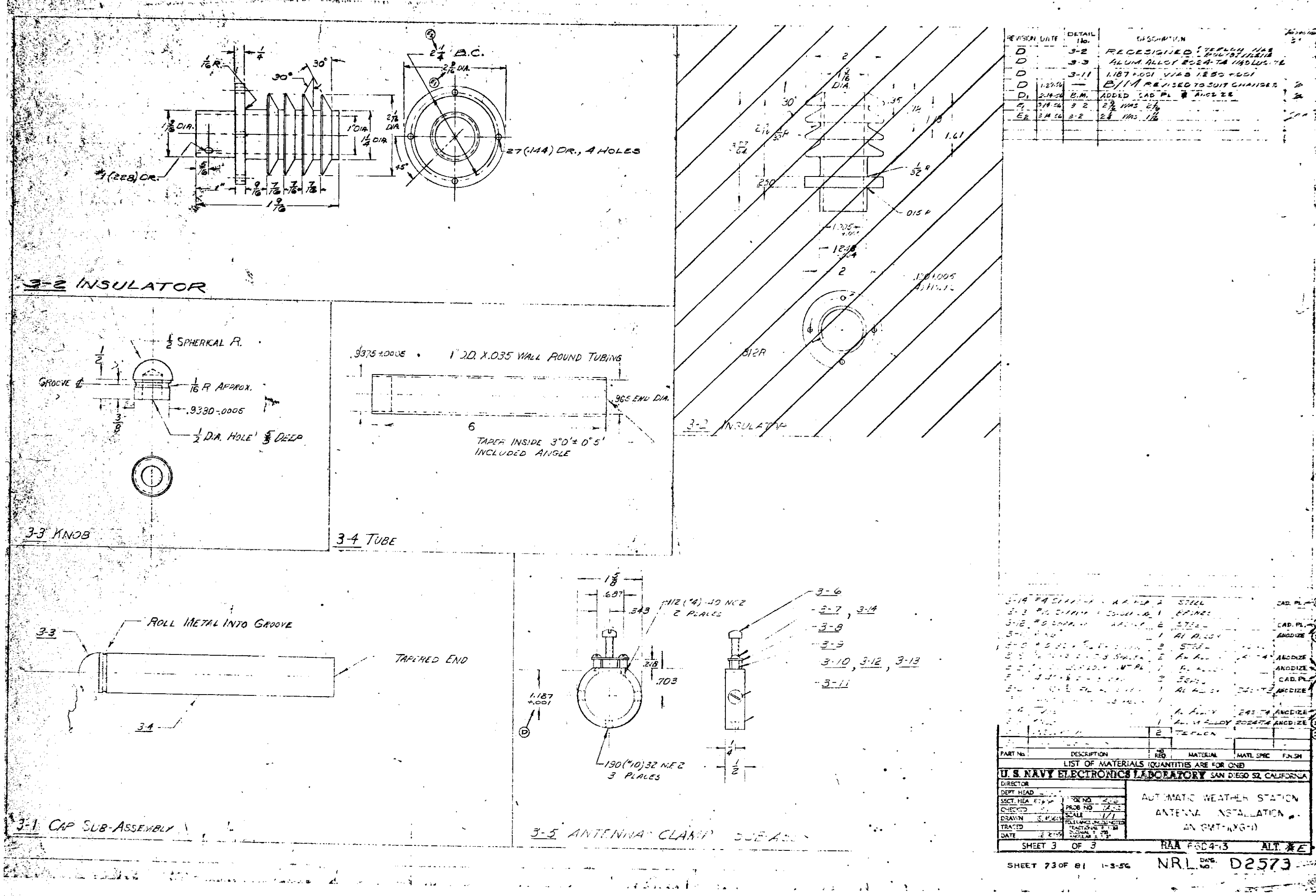
AUTOMATIC WEATHER STATION
ANTENNA INSTALLATION
AN/GMT-1(XN-1)

SCALE 1/1

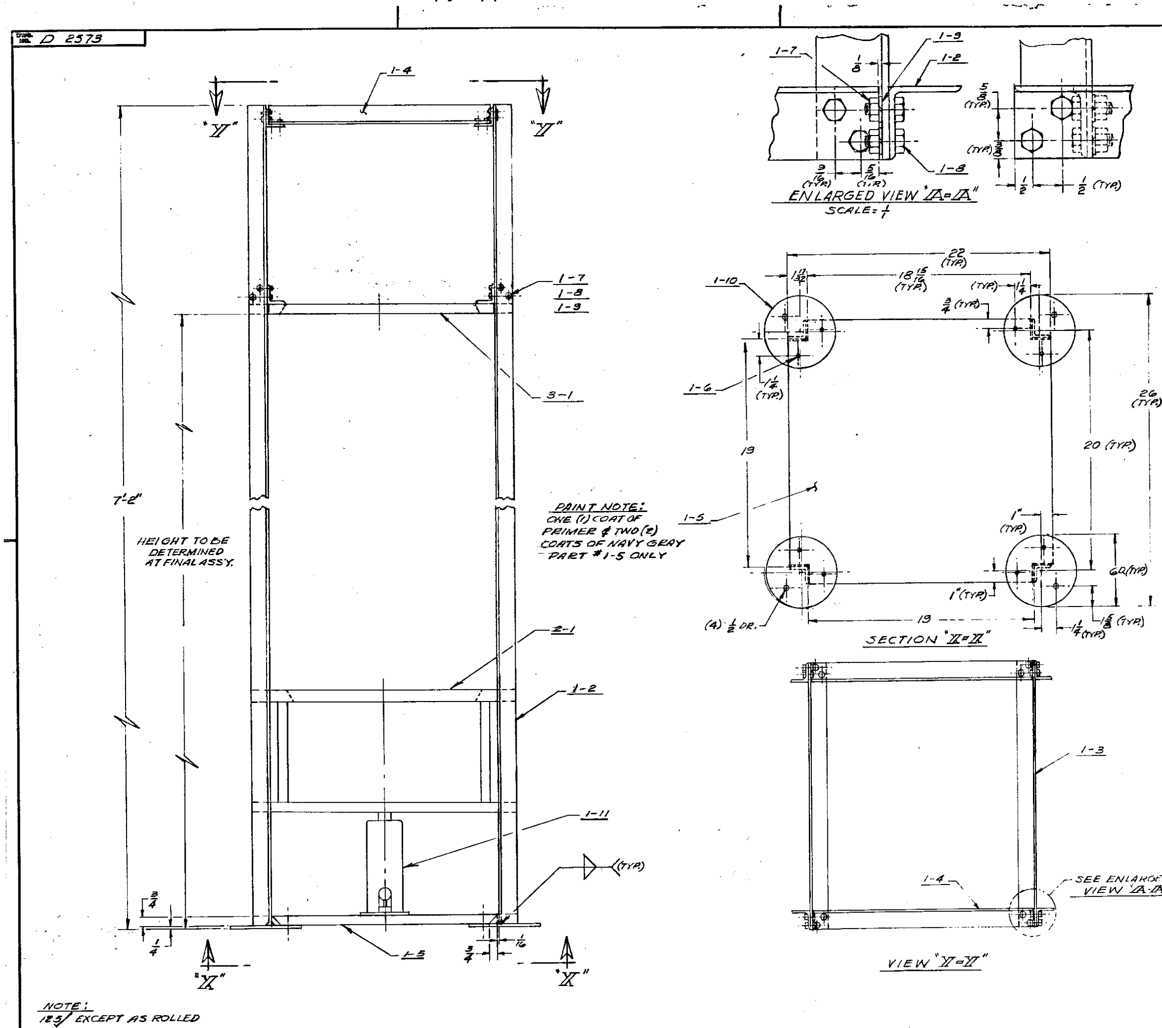
U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
CODE 405d PROB. 5D1
RAA 66 D 4 13
SHEET 1 OF 3 ALT E

SHEET 71 OF 81 1-3-56 N.R.L. DWG. NO. D2573


REVISIONS
SYM | DETAIL | DESCRIPTION | DATE | APPROVAL
D | 2-7 | REDESIGNED
D-1 | 2-8 | 1 1/4 DIA. WAS 1 1/8 DIA., TEFLON WAS POLY.
D-2 | 2-8 | 1/8 R. W 1/16 R.
D-3 | 2-8 | +.004 +.002 DIA. WAS +.003 +.005 DIA.
D | 2-10 | ADDED 1/8 R.
D | 2-11 | DELETED
D | — | B/M REVISED TO SUIT CHANGES | 1-27-56
D4 | B.M. | ADDED ANODIZE | 2-14-56
E | 2-7 | ADDED C'BORE | 3-22-56
NOTES:
WHERE DIMENSION IS GIVEN AS B +.001 +.004 THIS DIMENSION IS TO BE MADE SO AS TO GIVE .001 TO .004 CLEARANCE WITH MEASURED DIMENSION B AND LIKEWISE FOR OTHER LETTER DIMENSIONS.
COAT THREADS OF 2-6 WITH SILICONE GREASE
2-1 TUBE
2-2 TUBE
2-3 TUBE
2-4 TUBE
2-5 TUBE
2-6 TUBE
2-7 BODY
2-8 ANTENNA GUIDE
2-9 PLATE
2-10 RING
2-11 NUT
1 | 2-11 | NUT | AL ALLOY | ALCOA 24S-T3
1 | 2-10 | RING | AL ALLOY | 24S-T4 ANODIZE
1 | 2-9 | PLATE | AL ALLOY | 24S-T4 ANODIZE
1 | 2-8 | ANT. GUIDE | TEFLON
1 | 2-7 | BODY | TEFLON
1 | 2-6 | TUBE | AL ALLOY | ALCOA 24S-T3 ANODIZE
1 | 2-5 | TUBE
1 | 2-4 | TUBE
1 | 2-3 | TUBE
1 | 2-2 | TUBE
1 | 2-1 | TUBE | AL ALLOY | ALCOA 24S-T3 ANODIZE
REQ. | PART NUMBER | DESCRIPTION | MATERIAL | MATERIAL SPECIFICATION | UNIT WT | ZONE
LIST OF MATERIAL
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
ON FRACTIONS ± 1/64"
ON DECIMALS ± .005"
ON ANGLES ± 1/2°
AUTOMATIC WEATHER STATION
ANTENNA INSTALLATION
AN/GMT-1 (XG-1)
SCALE 1/1
U. S. NAVY ELECTRONICS LABORATORY
SAN DIEGO 52, CALIFORNIA
CODE 405 0 PROB. 501
RAA 66 D 4 13
SHEET 2 OF 3 ALT E
SHEET 72 OF 81 1-3-56
N.R.L. DWG. NO. D2573


3-2 INSULATOR
$2\frac{1}{4}$ B.C.
.27 (.144) DR., 4 HOLES
3-3 KNOB
$\frac{1}{2}$ SPHERICAL R.
GROOVE
$\frac{1}{16}$ R APPROX.
.9330-.0005
$\frac{1}{2}$ DIA. HOLE $\frac{5}{8}$ DEEP
3-4 TUBE
1" O.D. X.035 WALL ROUND TUBING
TAPER INSIDE 3°0' ± 0°5' INCLUDED ANGLE
3-1 CAP SUB-ASSEMBLY
ROLL METAL INTO GROOVE
TAPERED END
3-5 ANTENNA CLAMP SUB-ASSY
LIST OF MATERIALS (QUANTITIES ARE FOR ONE)
U. S. NAVY ELECTRONICS LABORATORY SAN DIEGO 52, CALIFORNIA
AUTOMATIC WEATHER STATION
ANTENNA INSTALLATION
SHEET 3 OF 3
SHEET 73 OF 81 1-3-56
N.R.L. D2573

DWG. NO. D 2573



REVISIONS

SYMBOL LETTER	DETAIL NO.	BY	DESCRIPTION	CHECKED BY	DATE

DETAIL NO.	DESCRIPTION	MATERIAL SPECIFICATIONS	NO. REQ'D.
3-1	SUB-ASSEMBLY		1
2-1	SUB-ASSEMBLY		1
1-11	JACK (BLACKHAWK MODEL BA-8.5)		1
1-10	6" DIA. X 1/4 THK. ALUM. ALLOY	6061-T6	4
1-9	1/4 LOCKWASHER STEEL	COMM.	32
1-8	1/4-20 NC-2 HEX. HD. BOLT X 5/8 LG. STEEL	COMM.	32
1-7	1/4 HEX. NUT. STEEL	COMM.	32
1-6	#10-FL. HD. X 1" LG. WOOD SCR., BRASS	COMM.	8
1-5	22 X 22 X 3/4 MARINE PLYWOOD	COMM.	1
1-4	1 1/2 X 1 1/2 ALUM. ALLOY	6061-T6	2
1-3	1 1/2 X 1 1/2 ALUM. ALLOY	6061-T6	2
1-2	1 1/2 X 1 1/2 ALUM. ALLOY	6061-T6	4
1-1	ASSEMBLY		1

LIST OF MATERIAL

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL DIMENSIONS = ± .005
FRACTIONAL DIMENSIONS = ± 1/64
ANGLE DIMENSIONS = ± 2°
DIMENSIONS IN INCHES

REFERENCE DRAWINGS

DO NOT SCALE DRAWINGS

SECURITY CLASSIFICATION: UNCLASSIFIED

BLDG 2 RM. 271 EXT. 612

SIGNATURES		DATE
DESIGN		
DRAWN	Sunderland	1/17/56
CHECKED	N.K.	1-17-56
UNIT		
BRANCH		
DIVISION		

NAVAL RESEARCH LABORATORY
WASHINGTON 25, D. C.

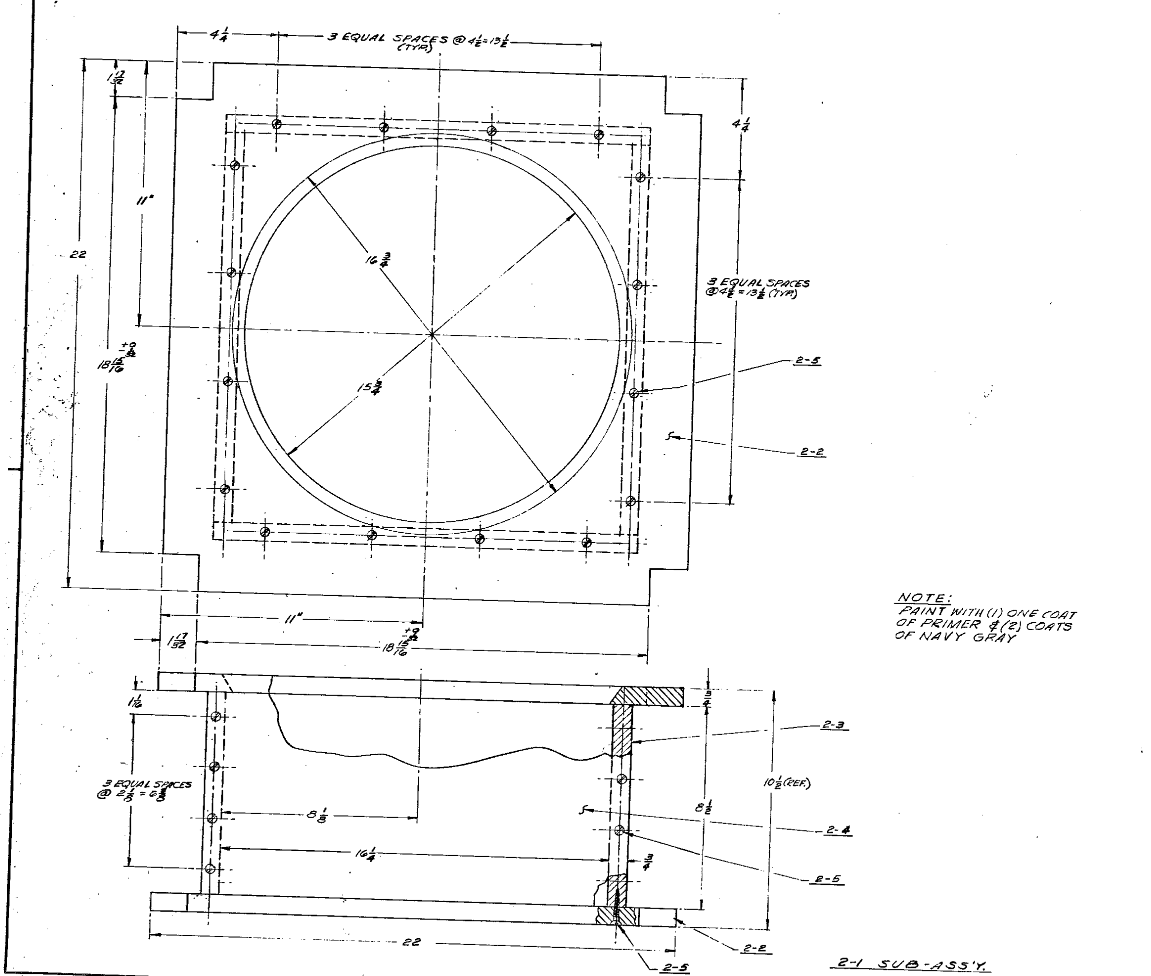
JIG & SHIPPING FRAME FOR AUTOMATIC WEATHER STATION ASSEMBLY

SCALE 1/4

FOR EXPERIMENTAL FABRICATION ONLY

SHEET 74 OF 81 1/3/56 N.R.L. DWG. NO. D 2573

DWG. NO. D 2573



NOTE:
PAINT WITH (1) ONE COAT OF PRIMER & (2) COATS OF NAVY GRAY

REVISION LETTER	DETAIL NO.	BY	DESCRIPTION	CHECKED BY	DATE

LIST OF MATERIAL

DETAIL NO.	DESCRIPTION	MATERIAL SPECIFICATIONS	NO. REQ'D.
2-5	#10 FL. HD. WOOD SCR. X 1½ LG. BRASS	COMM.	48
2-4	SIDES 17⅝ X 8½ X ¾ MARINE PLYWOOD	COMM.	2
2-3	SIDES 16¼ X 8½ X ¾ MARINE PLYWOOD	COMM.	2
2-2	TOP & BASE, ¾ MARINE PLYWOOD	COMM.	2
2-1	SUB-ASSEMBLY		1

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL DIMENSIONS = ± .005
FRACTIONAL DIMENSIONS = ± 1/64
ANGLE DIMENSIONS = ± 2°
DIMENSIONS IN INCHES

REFERENCE DRAWINGS

DO NOT SCALE DRAWINGS

SECURITY CLASSIFICATION: UNCLASSIFIED

SIZE 2 | 271 | 612

NAVAL RESEARCH LABORATORY
WASHINGTON 25, D. C.

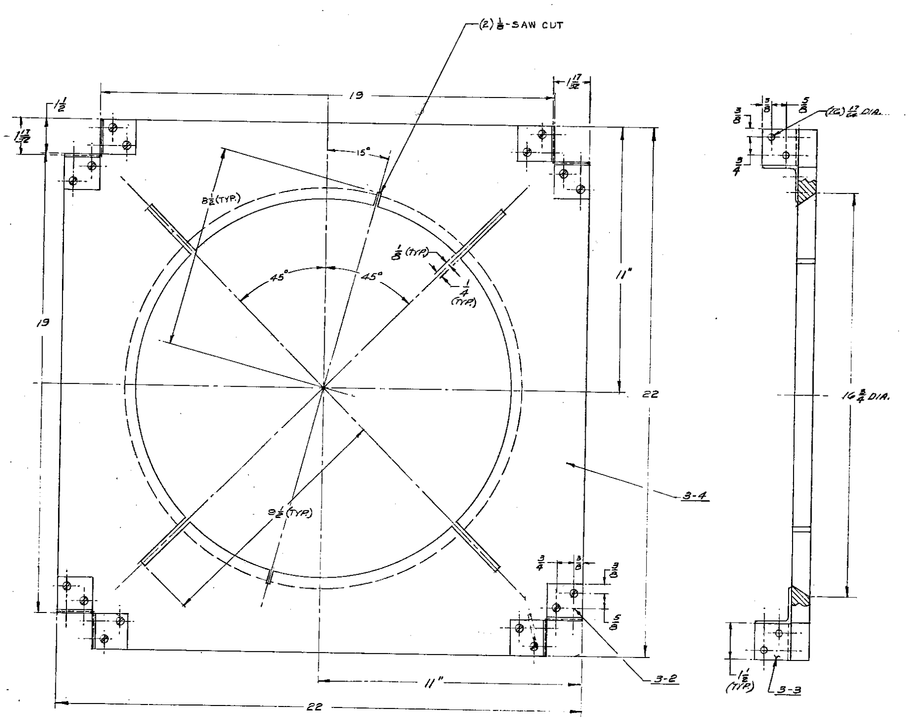
SIGNATURES		DATE
DESIGN		
DRAWN	SANDIFER	1/11/56
CHECKED	N.R.	1-27-56
UNIT		
BRANCH		
ORIGIN		

JIG & SHIPPING FRAME FOR AUTOMATIC WEATHER STATION
SUB-ASS'Y.

SCALE ½
FOR EXPERIMENTAL FABRICATION ONLY

SHEET 75 OF 81 1/3/56 N.R.L. DWG. NO. D 2573

DWG. NO. D 2573



PAINT NOTE:
ONE (1) COAT OF PRIMER
& TWO (2) COATS OF NAVY GRAY.

3-1 SUB-ASSEMBLY

REVISIONS

REVISION LETTER	DETAIL No.	BY	DESCRIPTION	CHECKED BY	DATE

LIST OF MATERIAL

DETAIL NO.	DESCRIPTION	MATERIAL SPECIFICATIONS	NO. REQ'D.
3-4	22X22X3/4 MARINE PLYWOOD	COMM.	1
3-3	1 1/2 X 1 1/2 L ANGLE ALUM. ALLOY	COMM.	8
3-2	#10-FL.HD. SCREW BRASS	COMM.	16
3-1	SUB-ASSEMBLY		1

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL DIMENSIONS = ±.005
FRACTIONAL DIMENSIONS = ±1/64
ANGLE DIMENSIONS = ±2°
DIMENSIONS IN INCHES

REFERENCE DRAWINGS

DO NOT SCALE DRAWINGS

SECURITY CLASSIFICATION: UNCLASSIFIED

BLDG 2 RM. 271 EXT. 612

SIGNATURES		DATE
DESIGN		
DRAWN	SANDIFER	1/18/55
CHECKED		
UNIT		
BRANCH		
ORIGIN		

NAVAL RESEARCH LABORATORY
WASHINGTON 25, D. C.

JIG & SHIPPING FRAME FOR AUTOMATIC WEATHER STATION
SUB-ASSEMBLY

SCALE 1/2

FOR EXPERIMENTAL FABRICATION ONLY

SHEET 76 OF 81 1/3/56 N.R.L. DWG. NO. D 2573

NE 140117
REPORT 229
PROBLEM NEL 5D1
WORK STATUS: 8 DECEMBER 1950
REPORT APPROVED: 9 MARCH 1951

RESTRICTED

final report: development of a parachute-type expendable automatic weather station

D. P. HERITAGE, DEVELOPMENT DIVISION

U. S. NAVY ELECTRONICS LABORATORY, SAN DIEGO, CALIFORNIA

RESTRICTED

CONTENTS

STATEMENT OF PROBLEM

BuShips problem NE 140117 (NEL 5D1): "Conduct research on, design, develop, and test a parachute-type expendable automatic weather station."

CONCLUSIONS

1. The equipment constructed at NEL is capable of sampling meteorological conditions and transmitting 3-minute messages every 6 hours for a period of 2 weeks.
2. Coded data can be received by standard ship, shore, or aircraft radio receivers, with no auxiliary recording equipment required.
3. Within the limits of the testing facilities available at NEL, the meteorological instruments contained in the Laboratory-designed equipment are within the limits of accuracy specified.

RECOMMENDATIONS

1. Perform additional meteorological instrument calibration tests where more adequate facilities are available than at NEL.
2. Conduct further operational tests (a) under conditions of heavy rainfall and high winds, and (b) in mountainous country under snow conditions.
3. When an adequate number of stations (10 or more) have been constructed, perform operational service tests which include:

    a. Drop tests in mountainous terrain (1) at several surface elevations, (2) on soft snow surfaces, and (3) on snow crust.
    b. Tests in Arctic regions.

4. Follow up design improvements suggested in this report that have resulted from information gained from tests to date.
5. Review the accuracy limitations set forth in the specifications.

WORK SUMMARY

A parachute-type weather station, capable of being dropped from aircraft and automatically transmitting coded information from sampled meteorological conditions, was built. Weather instruments incorporated in the equipment were calibrated and tested. Operational tests of the station were conducted in snow-covered regions in the Sierra Nevada Mountains.

Personnel engaged in this development problem were C.J. Casselman and D.P. Heritage of the Radio Branch, Development Division, and S.F. Moran, S.E. Welk, and W.E. Ballard of the Mechanical Development Branch, Development Division, U.S. Navy Electronics Laboratory.

This report covers work to 8 December 1950.

desired characteristics

Listed below are the more important requirements set forth in the Bureau of Ships problem assignment.

1. The equipment must be transportable by air, and rugged enough to withstand parachute drops.

2. The information transmitted from the unit shall be of such a nature as to permit reception by standard ship, shore, or aircraft radio receivers within range, without auxiliary recording equipment.

3. The meteorological instruments shall cover the following ranges, and possess the indicated accuracies:

Temperature: $-70^{\circ}F$ to $+110^{\circ}F$, with an accuracy of $\pm 2^{\circ}F$ at any point in the range.

Pressure: 580 to 1060 millibars in seven overlapping ranges; each range to be 120 mb, with an accuracy of ± 1.5 mb.

Relative Humidity: This quantity shall be measured in three ranges: (a) 15 per cent to 95 per cent (at temperatures of from $+110^{\circ}F$ to $+30^{\circ}F$) with an accuracy of ± 5 per cent; (b) 25 per cent to 95 per cent (at temperatures of from $+30^{\circ}F$ to $0^{\circ}F$) with an accuracy of ± 10 per cent; and (c) 40 per cent to 95 per cent (at temperatures of from $0^{\circ}F$ to $-40^{\circ}F$) with an accuracy of ± 20 per cent.

Wind Direction: 0° to 360°, with an accuracy of $\pm 7^{\circ}$.

Wind Velocity: 5 to 80 knots, with the following accuracies: ± 3 knots in the range 5 to 20 knots; ± 5 knots in the range 20 to 40 knots; ± 7 knots in the range 40 to 60 knots; and ± 9 knots in the range 60 to 80 knots.

4. The weight of the equipment, complete with parachute, shall not exceed 200 pounds, and the outside dimensions of the equipment shall be such that it may be carried on either external or internal bomb racks.

5. After the unit comes to rest on the ground, means shall be provided to orient the unit into an upright position. The self-righting mechanism shall be capable of erecting the equipment on surfaces sloping as much as 45°.

6. The battery used to supply power for the equipment shall have sufficient capacity at $-70^{\circ}F$ to allow 56 complete transmissions, corresponding to one transmission every 6 hours for 14 days.

design considerations

A pneumatic system for uprighting the weather station was selected in place of spring-loaded legs, because the pneumatic arrangement provides more power and control than the springs. Tests of the CFXL equipment on sloping terrain showed that the rather violent righting action resulting from the use of springs could cause the station to topple over, thus rendering it useless. By the use of suitable restrictors in the pneumatic lines, the self-righting process can be controlled to the desired speed.

International Morse Code was chosen for the transmission of weather-station information, since no additional equipment is needed at the receiving location. Basic code letters and the method of combining to form new letters were suggested by the Bureau of Standards.

Weather quantities are converted in the equipment to a variable resistance, upon which the operation of the coding mechanism depends. Mechanical coupling is used between the weather-measuring instruments and low-torque potentiometers. The reason for this choice, which was made early in the development of the weather station, was that, although all-electronic instruments were considered most desirable, instruments of this type were not considered practical for all five weather quantities. By a proper choice of potentiometer value, all five transducers were made to cover exactly the same resistance range. This design feature was one which simplified the associated self-balancing bridge circuitry.

In the design of a wind-direction transducer, the major problem was correlating the position of the wind vane with true, or magnetic, north. Many methods were considered, such as the use of a gyroscope, automatic direction finder, and flux-gate compass. The system chosen for the weather station, however, is a specially constructed magnetic compass coupled to a microtorque potentiometer. Relative simplicity of construction, lack of additional power requirements, and relatively low cost were the major reasons for this choice. The assignment letter suggested the investigation of gyroscopes for this application, but the following problems appeared to be too formidable: Drift might be excessive when the equipment is required to run for periods of time up to 10 minutes. There is a high probability of gimbal lock when the weather station rolls or bounces in various positions. The cost per unit is high, and there is a possibility of subjecting precision bearings to excessive shock.

DESCRIPTION OF WEATHER STATION

general

The NEL-designed weather station (shown in figure 1) consists of a bomb-shaped aluminum alloy structure containing a parachute, battery-powered transmitter, telescopic antenna, self-erecting mechanism, meteorological instruments, coding mechanism, and associated components. The over-all length is 6 feet, 8 inches, and the diameter of the case proper is 18-1/2 inches. However, stabilizing fins, which are arranged as shown in figure 2, extend radially an additional 8 inches.

The equipment can be carried on external wing racks at speeds up to 350 knots, and dropped at speeds up to 225 knots. A 30-foot "extended-skirt" type parachute canopy lowers the station at a rate of approximately 15 feet per second when dropped from altitudes in the vicinity of 1000 feet above sea level.

After the station reaches the ground, a parachute ground-release assembly (figure 3) disconnects the parachute to prevent dragging the equipment. A predetermined time later, an inert gas under a pressure of approximately 1000 psi is released into a pneumatic system, erecting the station by forcing six legs outward and downward, and at the same time extending a telescopic transmitting antenna. A check valve in the main line to the leg jacks maintains the pressure in these jacks, but, as an added safety feature, locking rings are provided in case a leak develops in the leg-jack system.

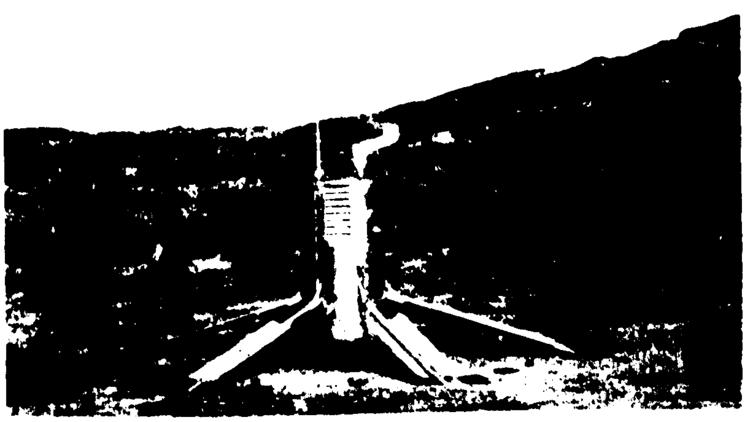


Figure 1.
Automatic weather station.

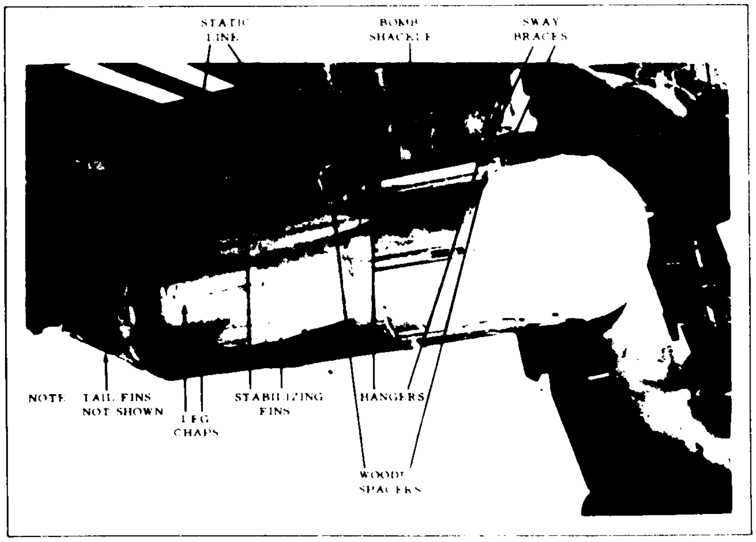


Figure 2. Weather station mounted on wing rack of F8F.

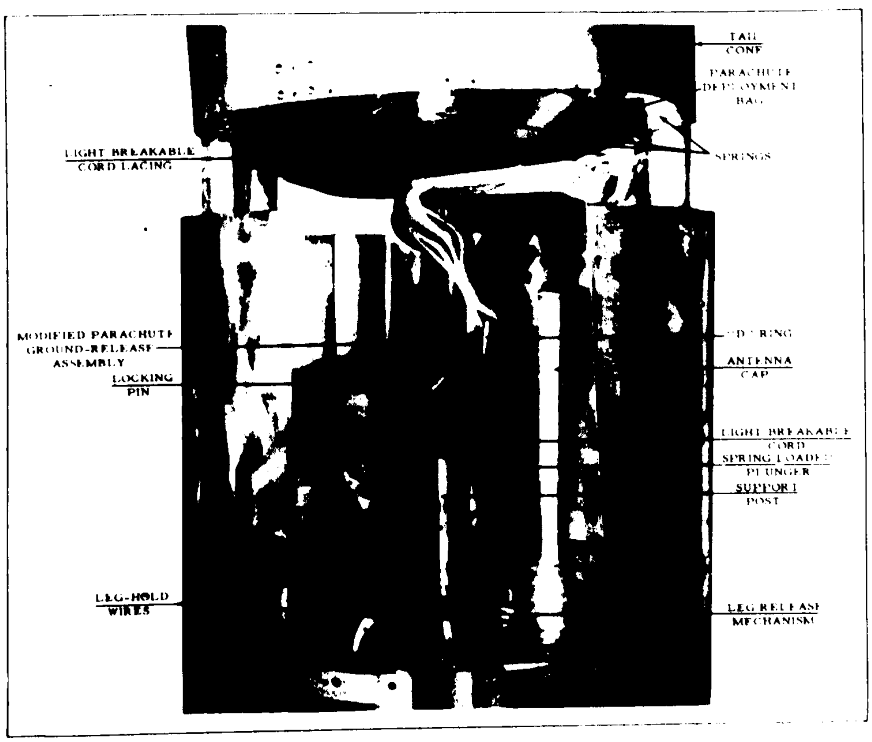


Figure 3. Tail cone partially installed in position.

Meteorological information is automatically transmitted at predetermined regular intervals on a frequency of 5072.5 kc, with a power output of 15 watts. These data are in the form of 3-letter code groups (International Morse) which can be readily converted to temperature, pressure, etc., by means of simple graphs or charts. The information for one complete transmission is transmitted in the sequence indicated in table 1.

Table 1. Transmission sequence.

Order of Transmission	Code Group Sent	Number of Repetitions
1	Identification Call	4
2	Wind Direction	3
3	Wind Velocity	3
4	Temperature	3
5	Atmospheric Pressure	3
6	Relative Humidity	3
7	Identification Call	5
8	Wind Direction	3
9	Wind Velocity	3
10	Temperature	3
11	Atmospheric Pressure	3
12	Relative Humidity	3
13	Identification Call	1

An automobile-type clock equipped with suitable contacts is used to start each transmission at any predetermined quarter-hour.

All five weather transducers in the station change meteorological quantities to resistance by means of mechanical coupling between the moving element and a low-torque potentiometer. Thus, the output of each instrument represents a variable resistance between the limits 0-to-2000 ohms.

Power for the equipment is furnished by a special 12-volt lead-acid type battery, plate voltage for the transmitter and self-balancing bridge being obtained from a modified Mallory vibrator.

A simple piece of auxiliary test equipment (figure 4) is provided with the weather station for convenience in checking the electronic equipment and keying the transmitter when it is mounted in the station or on the test bench. This test set plugs into the front of the power and timing unit, and allows rapid measurement of battery voltage, vibrator output voltage, power-amplifier plate current, bridge-amplifier plate current, and the combination of the power-amplifier screen grid current and oscillator plate current.

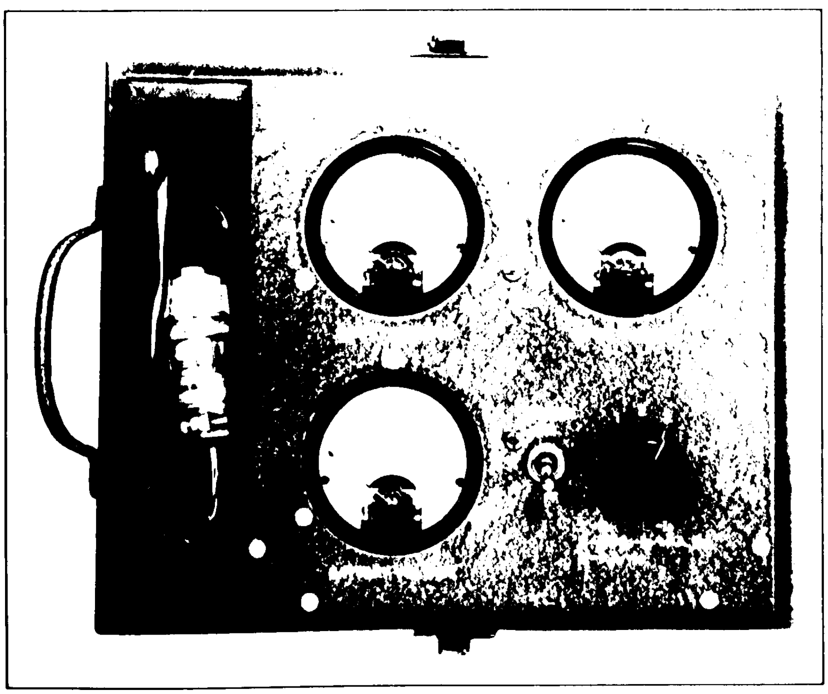


Figure 4. Test set.

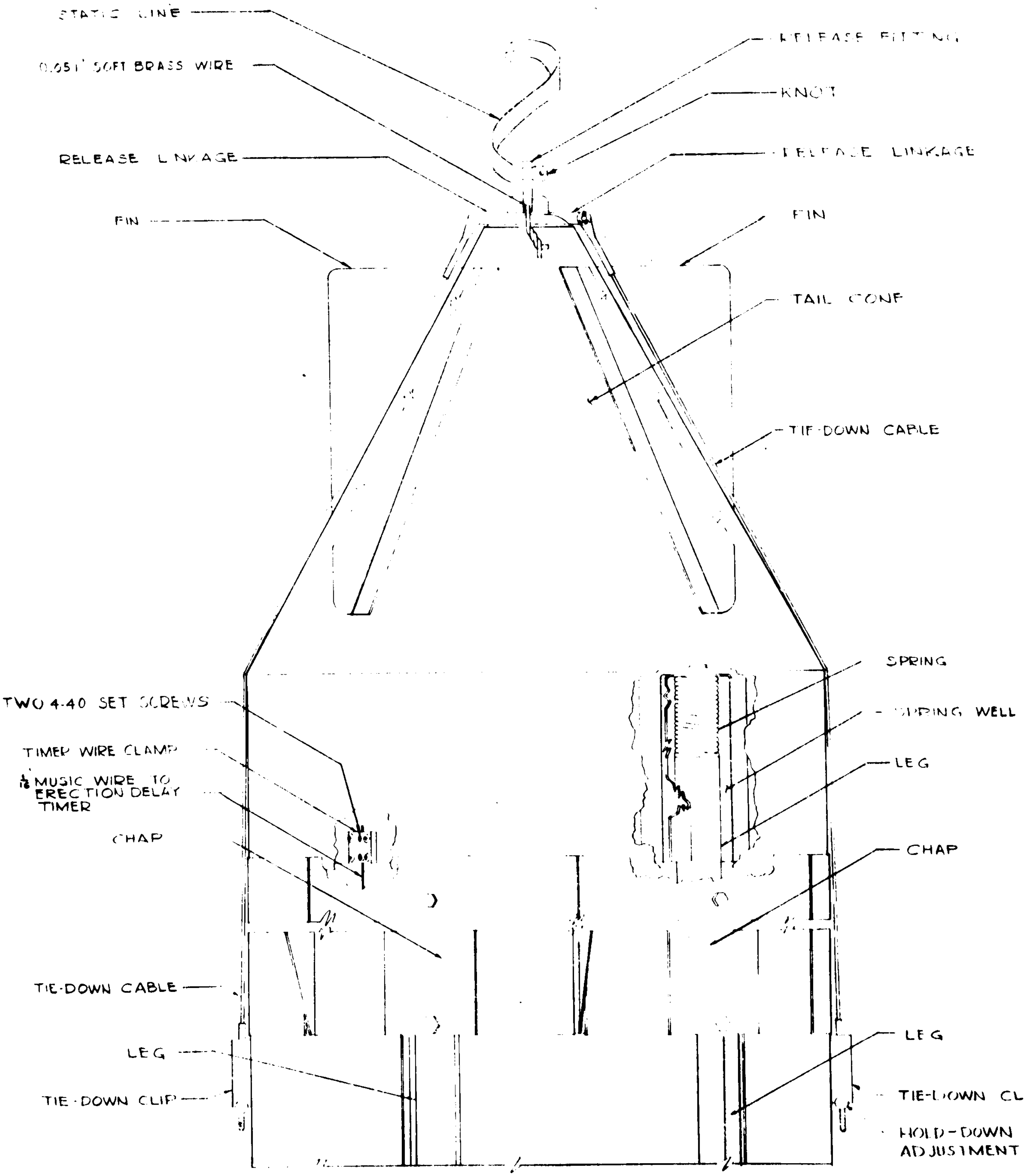


Figure 5. Tail cone installation.

sequence of operations

The sequence of operations of the weather station, from the time it is dropped from the aircraft until it has completed its first transmission is outlined below:

1. The weather station is released from the aircraft bomb shackle.

2. A static cord releases the tail cone tie-down cables (figure 5).

3. The spring-loaded tail cone (figure 6) is ejected, deploying the parachute, and simultaneously starting the erection-delay timer.

4. The weight of the weather station removes spring pressure from the locking pin in the parachute ground-release assembly, allowing the pin to fall free.

5. When the station strikes the ground, weight is removed from the parachute ground-release assembly, automatically releasing the parachute.

6. The station comes to a stop, and remains in this position until the erection-delay switch closes. The self-righting valve is then opened, allowing gas to flow into the pneumatic uprighting system.

7. Simultaneously, by gas pressure: (a) The post release is actuated, ejecting a spring-loaded center supporting post. This post, which projects above the top deck as shown in figure 7, must be removed to allow the wind vane to rotate. Its ejection is also an additional safety feature which assures the separation of the parachute from the station in the event the ground-release assembly fouls. (b) The leg release is actuated, freeing the leg-hold wires. (The four stabilizing fins fall free.) (c) Leg jacks force the six legs outward and downward, erecting the station to a position perpendicular to the ground. A check valve in the main line to the leg jacks prevents collapse of the station if gas should leak from the system ahead of the check valve.

8. Forty-five seconds after the erection-delay switch closes, a thermal time-delay relay opens the antenna erection valve, extending the telescopic antenna.

The weather station is now ready to start its transmission schedule of meteorological measurements. The starting time of transmission is determined by the preset arrangement of the clock contacts in the timing unit (figure 8).

9. At the predetermined time the clock contacts close, and voltage is applied to the vacuum-tube heaters, as well as to a thermal time-delay relay.

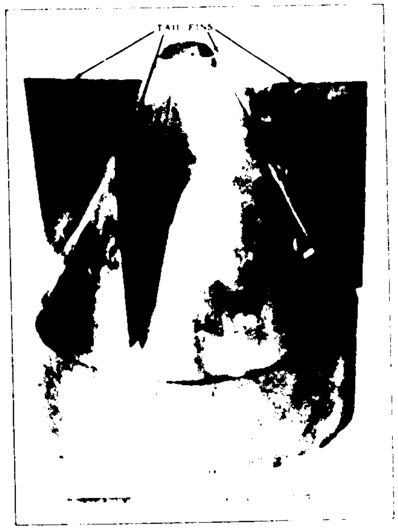


Figure 6. Tail cone.

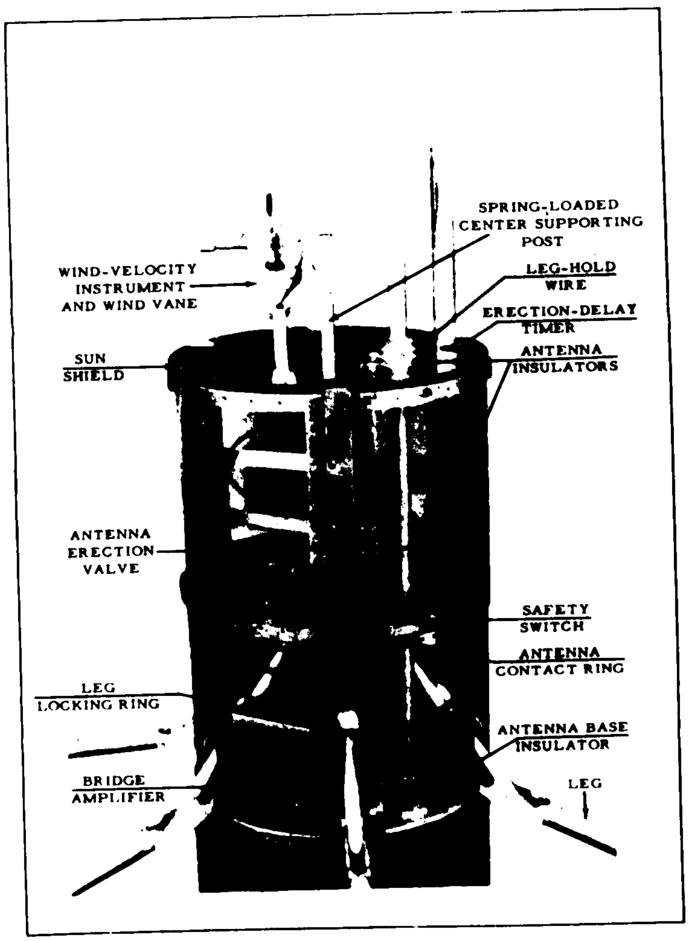


Figure 7. Weather station structure.

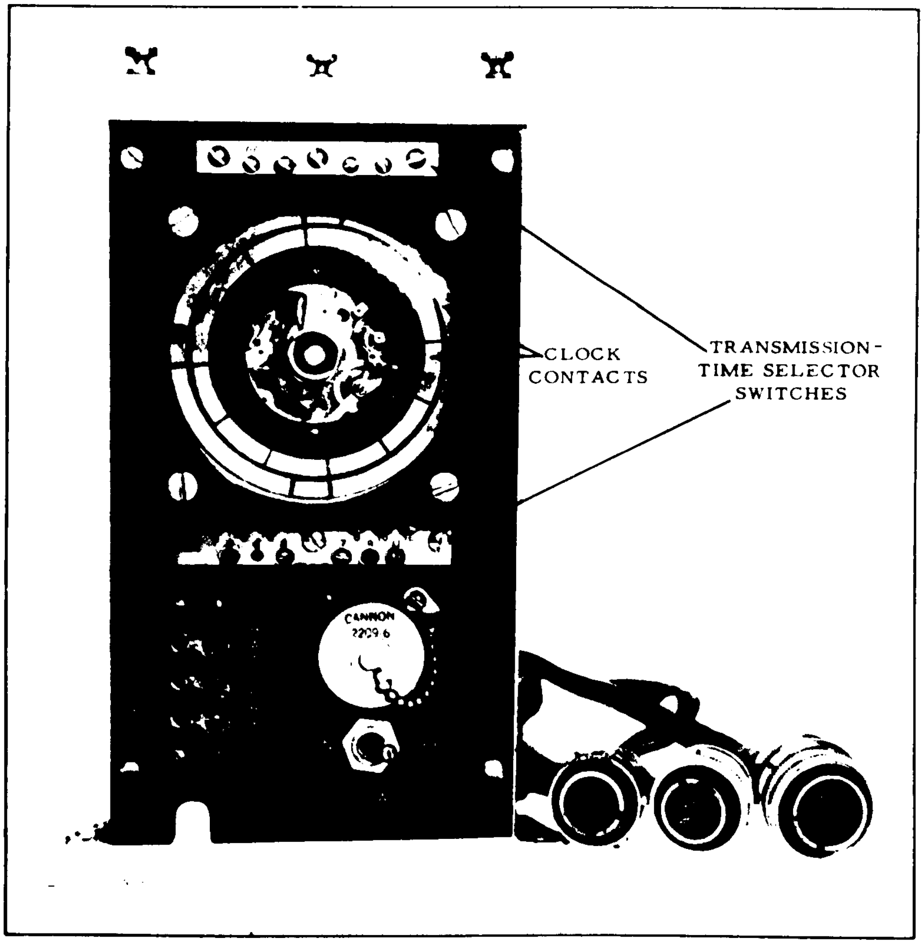


Figure 8. Power supply and timing unit.

10. After a delay of 30 seconds for the equipment to warm up, the time-delay relay closes, applying voltage to the vibrator and code-selection-mechanism motor.

11. A microswitch, in parallel with the clock contacts, keeps dc applied to the proper relays until the complete sequence of code groups has been transmitted. At the end of this time, a cam opens the microswitch, removing all voltages from the electronic equipment.

The equipment is now in stand-by condition until the clock contacts again close to start the next transmission.

interpretation of transmitted data

The sample work sheet shown in figure 9 has been filled out to show the code groups converted to weather data. The code-letter versus resistance chart (table 2) is used to convert the last two letters of each code group to corresponding resistance values. With the exception of atmospheric pressure, all meteorological quantities can be obtained by direct reference to the corresponding instrument calibration curves. The correct atmospheric pressure is obtained by the following procedure:

1. Determine the necessary temperature correction. In the example, the air temperature is $+105^{\circ}F$, and the resistance reading is 1110 ohms. Referring to the temperature correction chart shown in table 3, it is found that, at a temperature of $+105^{\circ}F$ and a resistance of 1110 ohms, a correction of 17 ohms is required. Since the air temperature is above $+70^{\circ}F$, this value must be added to the original value of 1110 ohms, giving a total of 1127 ohms.

2. This new resistance value is then used with the atmospheric pressure calibration curve (figure 10) to determine the pressure in millibars. It will be noted that this graph consists of a family of curves, with temperature as the parameter. Interpolation between the curves yields a pressure of 1004.2 mb for the example.

Time of Last Transmission:

Expected Time of Next Transmission:

Date

Time

Location of Transmitter

Serial No. of Weather Station

Call Letters	Wind Dir.	Wind Vel.	Air Temp.	Bar. Press.	Rel. Hum.	Call Letters
NIB	BVB	VTI	TMI	UBT	SNT	NIB
NIB	BVB	VTI	TMI	UBT	SNT	NIB

EVALUATION OF WX TRANSMISSION

Temperature correction applied ONLY to the barometric pressure transmission.

If the air temperature is above 70°F, the correction is added.

If the air temperature is below 70°F, the correction is subtracted.

Code Letters	Resistance (ohms)	Temperature Correction (ohms)	Corrected Resistance (ohms)	Corrected Atmospheric Equivalent	
B V B	609	XXXXXXX	XXXXXXX	348	degrees
V T I	334	XXXXXXX	XXXXXXX	16	mph*
T M I	1656	XXXXXXX	XXXXXXX	+ 105	°F
U B T	1110	17	1127	1004.2	millibars
S N T	1670	XXXXXXX	XXXXXXX	.82	per cent R.H.

***Miles per hour x 0.8684 = knots**

Figure 9. Sample data sheet.

Table 2. Code-letter versus resistance chart for AN/GMT-1(XG-1) Automatic Weather Station.

ID	0	WG	430	KV	950	UI	1460	DN	1978
IS	0	WU	443	BV	955	UA	1470	DD	1991
IH	0	WM	457	BK	966	MA	1477	DS	2005
II	0	WN	471	BB	980	MT	1489	SS	2010
IA	0	WD	482	BG	991	MW	1502	SH	2023
IT	0	WS	494	BU	1003	MV	1516	SI	2030
IW	10	WH	508	BM	1015	MK	1531	SA	2045
IV	20	WI	522	BN	1028	MB	1545	ST	2060
IK	34	WA	535	BD	1043	MG	1557	SW	2072
IB	48	WT	549	BS	1058	MU	1569	SV	2084
IG	60	WW	560	BH	1071	MM	1582	SK	2098
IU	72	WV	572	BI	1084	MN	1596	SB	2112
IM	80	WK	587	BA	1097	MD	1611	SG	2127
AM	84	WB	603	BT	1110	MS	1627	SU	2142
AN	98	VB	609	BW	1120	MH	1642	SM	2154
AD	110	VG	618	GW	1125	MI	1656	SN	2166
AS	123	VU	629	GV	1135	NI	1660	SD	2177
AH	138	VM	643	GK	1150	NA	1666	HD	2182
AI	153	VN	658	GB	1166	NT	1670	HS	2190
AA	165	VD	670	GG	1178	NW	1687	HH	2205
AT	178	VS	680	GU	1190	NV	1705	HI	2221
AW	189	VH	694	GM	1203	NK	1720	HA	2231
AV	200	VI	708	GN	1216	NB	1736	HT	2243
AK	215	VA	721	GD	1230	NG	1751	HW	inf
AB	230	VT	735	GS	1244	NU	1765	HV	inf
AG	242	VW	748	GH	1258	NM	1777	HK	inf
AU	254	VV	762	GI	1272	NN	1790	HB	inf
TU	264	VK	774	GA	1286	ND	1802	HG	inf
TM	268	KK	780	GT	1301	NS	1815	HU	inf
TN	290	KB	790	UT	1305	NH	1826		
TD	300	KG	805	UW	1312	DH	1830		
TS	311	KU	816	UV	1322	DI	1843		
TH	322	KM	827	UK	1338	DA	1857		
TI	334	KN	839	UB	1354	DT	1872		
TA	348	KD	854	UG	1368	DW	1886		
TT	362	KS	870	UU	1382	DV	1900		
TW	376	KH	884	UM	1396	DK	1911		
TV	390	KI	899	UN	1410	DB	1923		
TK	403	KA	911	UD	1422	DG	1935		
TB	416	KT	925	US	1434	DU	1948		
TG	426	KW	937	UH	1447	DM	1963		

N Call — B Direction — V Velocity — T Temperature — U Pressure — S Humidity

Table 3. Temperature correction chart for atmospheric pressure transmissions.

TEMP.	RESISTANCE (ohms)										
°F	100	200	300	400	500	600	700	800	900	1000	1100
120	0	0	7	9	11	13	16	18	20	22	24
115	0	0	6	8	10	12	14	16	18	20	22
110	0	0	5	7	9	11	12	14	16	18	20
105	0	0	5	6	8	9	11	12	14	16	17
100	0	0	0	5	7	8	9	11	12	13	15
95	0	0	-	0	6	7	8	9	10	11	12
90	0	0	-	-	0	5	6	7	8	9	10
85	0	0	-	-	-	0	5	5	6	7	7
80	0	0	-	-	-	-	0	0	0	0	5
75	0	0	-	-	-	-	0	0	0	0	0
70	-	-	-	-	-	-	-	-	-	-	-
65	0	0	-	-	-	-	0	0	0	0	0
60	0	0	-	-	-	-	0	0	0	0	5
55	0	0	-	-	-	0	5	5	6	7	7
50	0	0	-	-	0	5	6	7	8	9	10
45	0	0	-	0	6	7	8	9	10	11	12
40	0	0	0	5	7	8	9	11	12	13	15
35	0	0	5	6	8	9	11	12	14	16	17
30	0	0	5	7	9	11	12	14	16	18	20
25	0	0	6	8	10	12	14	16	18	20	22
20	0	0	7	9	11	13	16	18	20	22	24
15	0	5	7	10	12	15	17	20	22	24	27
10	0	5	8	11	13	16	19	21	24	27	29
5	0	6	9	12	14	17	20	23	26	29	32
0	0	6	9	12	16	19	22	25	28	31	34
-5	0	7	10	13	17	20	23	27	30	33	37
-10	0	7	11	14	18	21	25	28	32	36	39
-15	0	8	11	15	19	23	26	30	34	38	42
-20	0	8	12	16	20	24	28	32	36	40	44
-25	0	8	13	17	21	25	30	34	38	42	46
-30	0	9	13	18	22	27	31	36	40	44	49
-35	5	9	14	19	23	28	33	37	42	47	51
-40	5	10	15	20	24	29	34	39	44	49	54
-45	5	10	15	20	26	31	36	41	46	51	56
-50	5	11	16	21	27	32	37	43	48	53	59
-55	6	11	17	22	28	33	39	44	50	56	61
-60	6	12	17	23	29	35	40	46	52	58	63
-65	6	12	18	24	30	36	42	48	54	60	66
-70	6	12	19	25	31	37	44	50	56	62	68

Table 3 (Cont'd).

TEMP.	RESISTANCE (ohms)										
°F	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200
120	27	29	31	33	36	38	40	42	44	47	49
115	24	26	28	30	32	34	36	38	40	42	44
110	21	23	25	27	28	30	32	34	36	37	39
105	19	20	22	23	25	26	28	30	31	33	34
100	16	17	19	20	21	23	24	25	27	28	29
95	13	14	16	17	18	19	20	21	22	23	24
90	11	12	12	13	14	15	16	17	18	19	20
85	8	9	9	10	11	11	12	13	13	14	15
80	5	6	6	7	7	8	8	8	9	9	10
75	0	0	0	0	0	0	0	0	0	0	5
70	-	-	-	-	-	-	-	-	-	-	-
65	0	0	0	0	0	0	0	0	0	0	5
60	5	6	6	7	7	8	8	8	9	9	10
55	8	9	9	10	11	11	12	13	13	14	15
50	11	12	12	13	14	15	16	17	18	19	20
45	13	14	16	17	18	19	20	21	22	23	24
40	16	17	19	20	21	23	24	25	27	28	29
35	19	20	22	23	25	26	28	30	31	33	34
30	21	23	25	27	28	30	32	34	36	37	39
25	24	26	28	30	32	34	36	38	40	42	44
20	27	29	31	33	36	38	40	42	44	47	49
15	29	32	34	37	39	42	44	46	49	51	54
10	32	35	37	40	43	45	48	51	53	56	59
5	35	38	40	43	46	49	52	55	58	61	63
0	37	40	44	47	50	53	56	59	62	65	68
-5	40	43	47	50	53	57	60	63	67	70	73
-10	43	46	50	53	57	60	64	68	71	75	78
-15	45	49	53	57	60	64	68	72	75	80	83
-20	48	52	56	60	64	68	72	76	80	84	88
-25	51	55	59	63	68	72	76	80	84	89	93
-30	53	58	62	67	71	75	80	84	89	93	98
-35	56	61	65	70	75	79	84	89	93	98	103
-40	59	63	68	73	78	83	88	93	98	103	107
-45	61	66	71	77	82	87	92	97	102	107	112
-50	64	70	75	80	85	91	96	101	107	112	117
-55	67	72	78	83	89	94	100	106	111	117	122
-60	70	75	81	87	92	98	104	110	115	121	127
-65	72	78	84	89	96	101	108	114	120	126	132
-70	75	81	87	93	100	106	112	118	124	131	137

For temperatures above 70°F the corrections are added.
For temperatures below 70°F the corrections are subtracted.

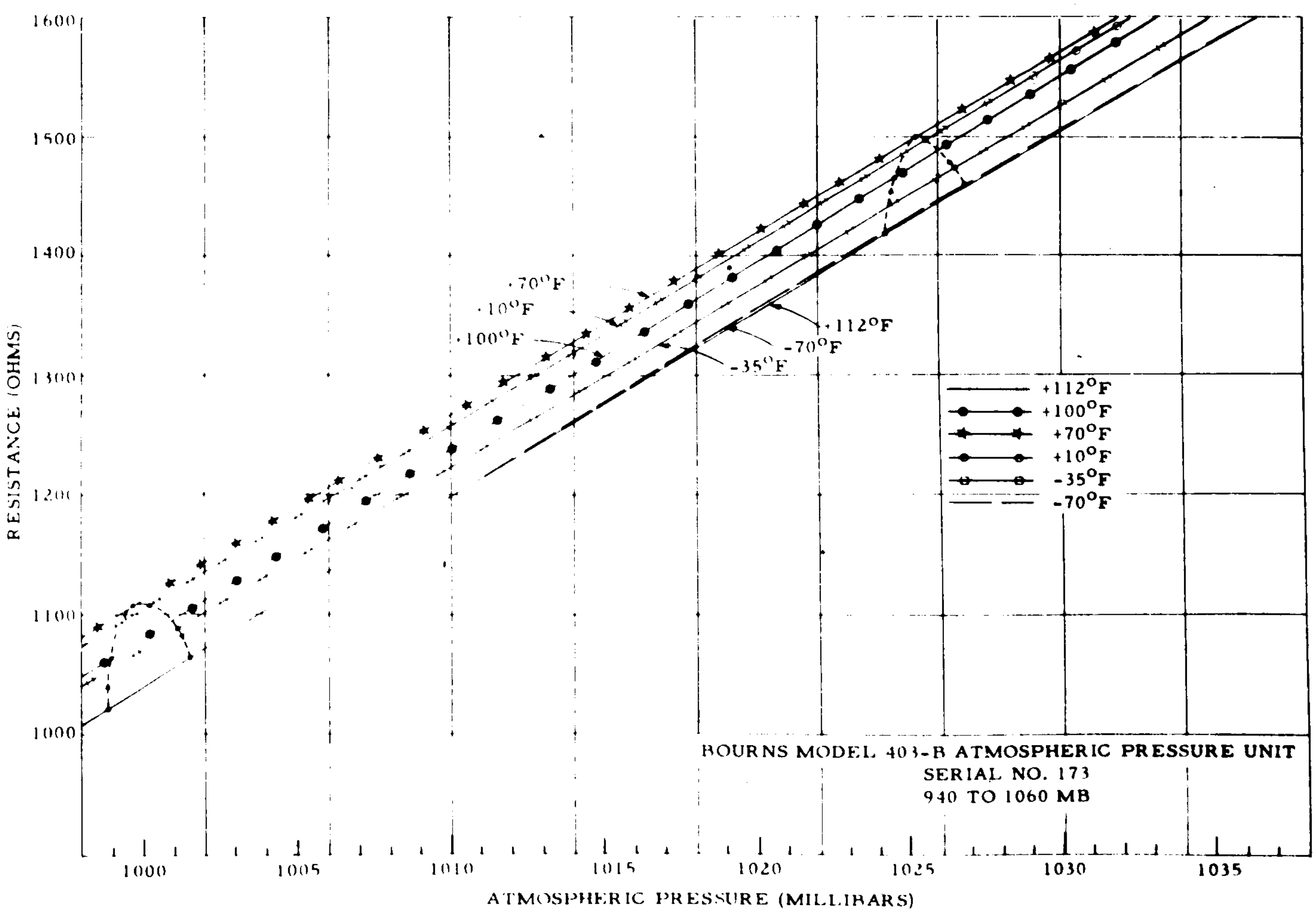


Figure 10. Atmospheric pressure calibration curve.

mechanical components

General Structure

The weather station is designed for maximum strength consistent with the weight limitations by using aircraft-type construction of aluminum alloy.

Three decks divide the interior into two main compartments. (See figure 11.) Six side panels are provided to enclose these compartments, and are utilized to carry some of the impact shock and forces resulting from erecting the station. Louvers at the upper compartment level allow ventilation for the meteorological instruments. (See figure 1.) Panels attached to each of the six legs cover the louvers when the station is stowed and ready for dropping. Four fins, necessary to stabilize the weather station during parachute deployment, are held securely in place by the leg panels. A polished false deck is attached to the main top deck by insulating spacers to reduce the heating effects of the sun.

The battery is contained in a hemispherical nose section below the lower deck. An air-filled plastic ball is placed between the battery box and the nose section to absorb some of the landing shock. As an additional shock absorber, the hemispherical aluminum alloy nose section is made so that it will partially crush on impact.

The cone-shaped tail section (figure 6) contains the parachute packed in a special deployment bag. During an early phase of the drop, the tail section is ejected by means of compressed springs allowing the parachute to deploy.

Self-Righting Mechanism

Erection of the weather station is accomplished by means of a pneumatic system consisting of a cylindrical pressure tank (figure 11) containing helium at a nominal pressure of 1000 psi, six pneumatic leg jacks, a hammer-actuated valve (figures 12 and 13), suitable restrictors, and interconnecting tubing.

A second hammer-actuated valve releases gas pressure to the lower end of a telescopic antenna, forcing it to extend. The sections of tubing are locked in the extended position by the use of tapered upper ends and flared lower ends.

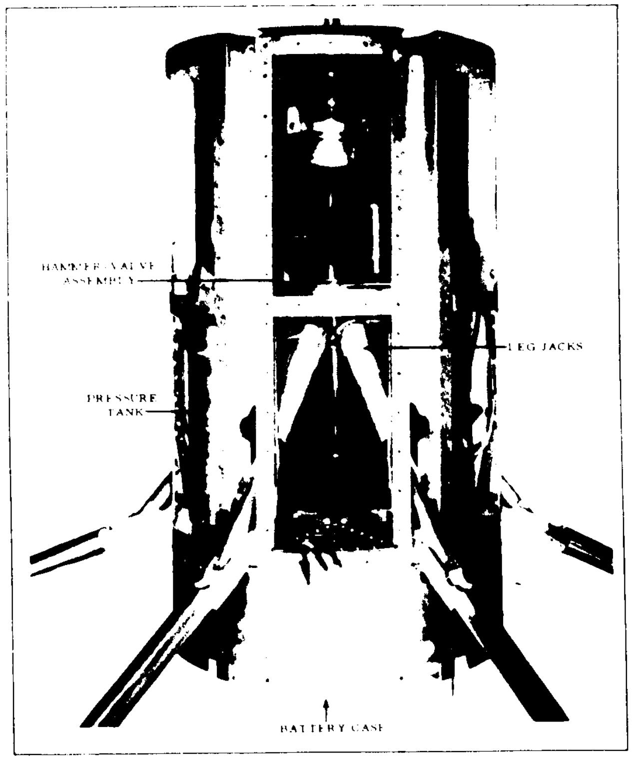


Figure 11.
Self-righting mechanism.

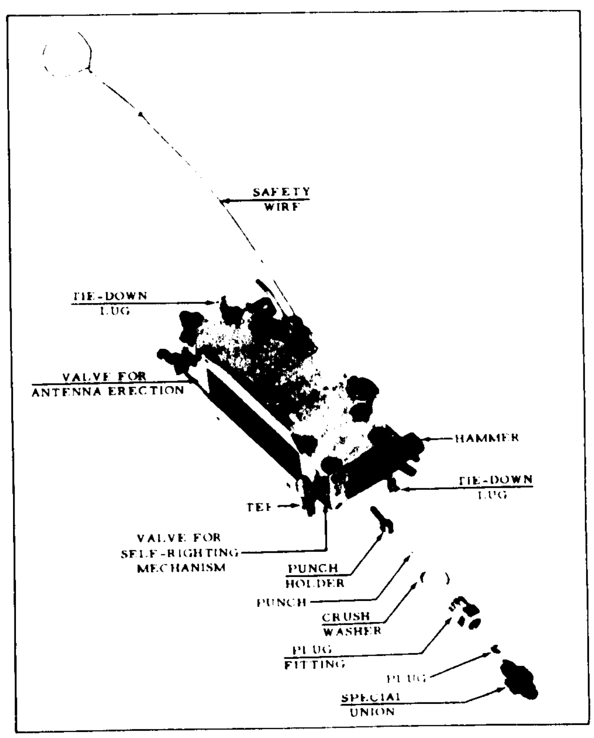


Figure 12.
Hammer valve assembly.

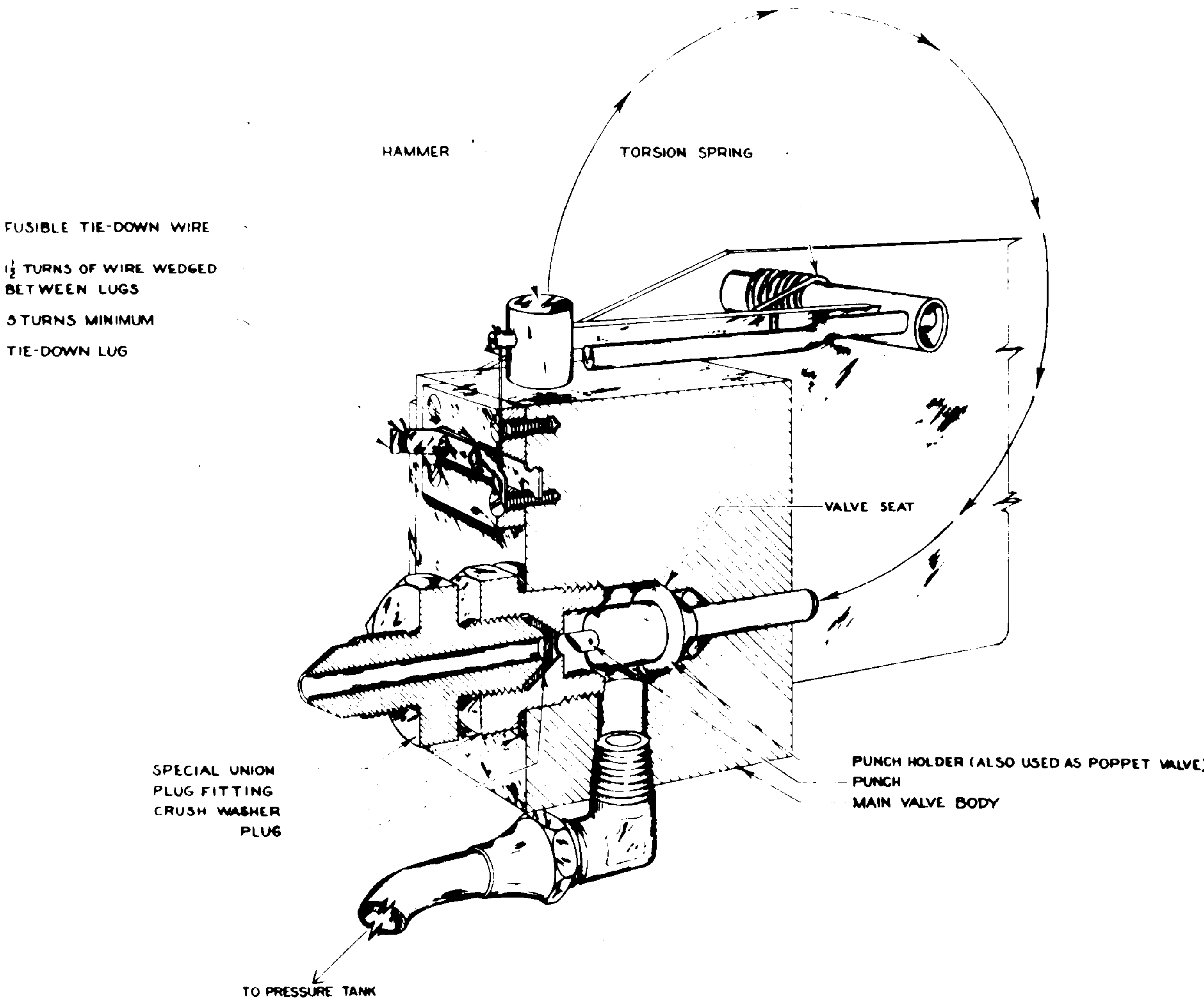


Figure 13. Pictorial of hammer valve.

Parachute

The parachute design and fabrication were undertaken by the Parachute Experimental Unit at El Centro, California. Requirements for the system were (1) sufficient structural strength to withstand dynamic loads at speeds up to 225 knots with a suspended load of 200 pounds and (2) maximum descent rate of 18 feet per second.

Numerous tests were made to determine a design that would provide maximum stability and, at the same time, subject the weather station to minimum deceleration. An extended-skirt type parachute proved to be the only design tested which would satisfy the performance requirements without exceeding the allowable packing volume. Upon completion of approximately 1600 dummy drop tests, it was determined that an extended-skirt canopy 30 feet in diameter (incorporating an extension of 12.5 per cent of the diameter) would be an optimum configuration. Design information, specifications, and fabrication data are contained in reference 4 (see list of references).

electric and electronic components

Power Supply

Power for the weather station is furnished by a special purpose, lead-acid type storage battery (see figure 14), Type BB-242/U, manufactured by the Willard Storage Battery Company. The battery weighs 31 pounds, and its over-all dimensions are 8 x 7-3/4 x 6-1/4 inches. At -70°F, the battery has sufficient capacity to allow a 3-minute transmission every 6 hours for a period of 2 weeks. At higher temperatures, there will be a corresponding increase in operating life.[3] In regions where subzero temperatures are expected, the specific gravity of the electrolyte should be increased from its normal value of 1.285 to 1.350.

The battery is mounted in a tight-fitting aluminum case, which is packed in the main battery box with excelsior (or spun glass for low temperatures). This packing arrangement is used because some trouble was experienced with the plastic cases cracking during early experiments.

Plate voltage for the transmitter and self-balancing bridge, as well as ac for the bridge, are obtained from a type VP-G556, 12-volt Mallory Vibrapack mounted in the power and timing unit.

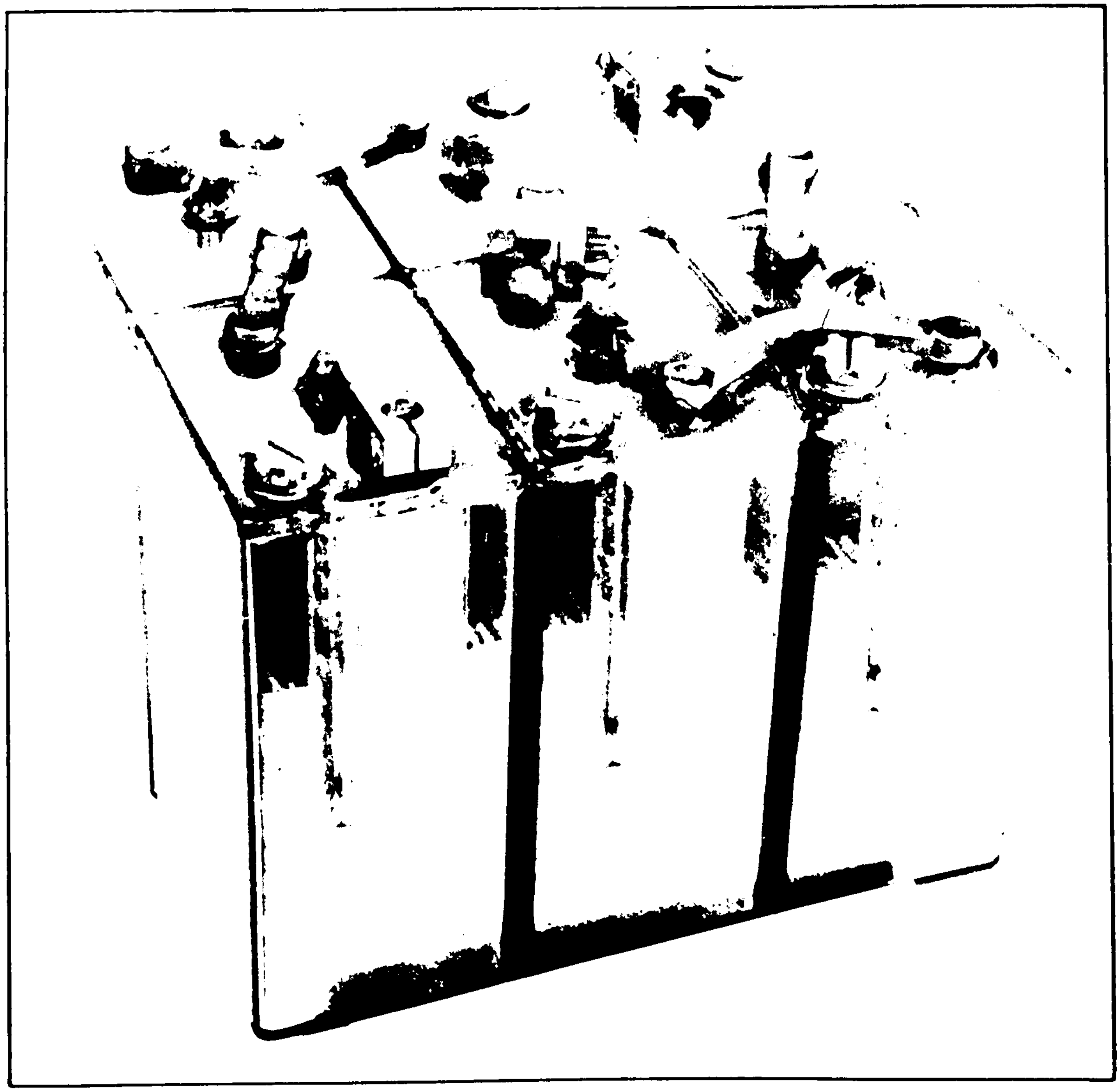


Figure 14. Storage battery.

NOTES:

1. K102, K103, K104, K105, PARTS IN HERMETICALLY SEALED RELAY ASSEMBLY, K106.
2. SCHEMATIC INDICATES POSITION OF RELAYS DURING TRANSMISSION OF CALL LETTERS.

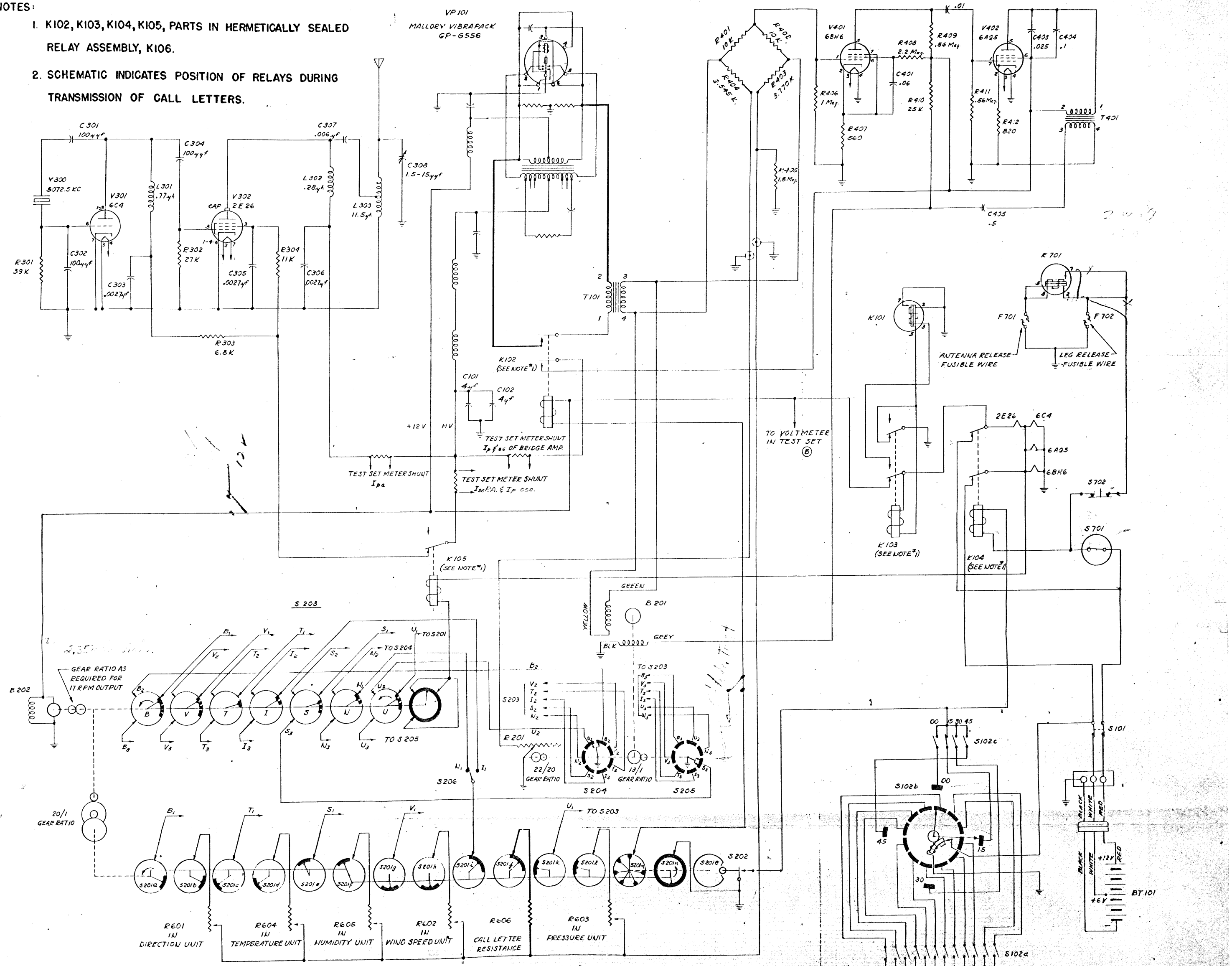


Figure 15. Schematic diagram of weather station.

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Transmitter and Antenna

The main features of the transmitter and antenna coupling design are simplicity of the circuitry employed and ease of tuning. Only one control is required.

The transmitter consists of a Pierce-type, crystal-controlled oscillator (see figure 15), employing a type 6C4 tube, which drives a 2E26 Class C amplifier. The power output to the antenna is approximately 15 watts. As shown in figure 16, the final tank coil and antenna-trimmer capacitor are housed in a plastic cover which serves to protect these elements from driving rain and dust.

Coupling to the antenna is made by means of a circuit requiring a minimum of components and adjustments. Initial loading is accomplished by adjusting a tap on the tank coil, and the antenna circuit is trimmed to resonance by means of a small tuning capacitor.

The weather station uses a telescopic whip antenna of aluminum tubing that extends 13 feet, 8 inches above the top deck. This antenna length, which is a compromise between radiation efficiency and mechanical strength, is approximately 1/15-wavelength long at the operating frequency of 5072.5 kc. This results in necessarily low radiation and coupling efficiencies. To keep the coupling and tank-circuit efficiencies as high as possible, a relatively large coil, having a Q of about 300, is used in the transmitter.

Losses in the ground due to poor conductivity form an appreciable part of the antenna system losses. As a consequence, the antenna loading and tuning are affected by operation over grounds having different conductivities. For optimum efficiency, it would be necessary to load and tune the transmitter over ground similar to that existing at the proposed operating site. An approximation to this can be made if the equipment is calibrated over several types of ground, and an appropriate adjustment of the tuning and loading made when preparing the station for use.

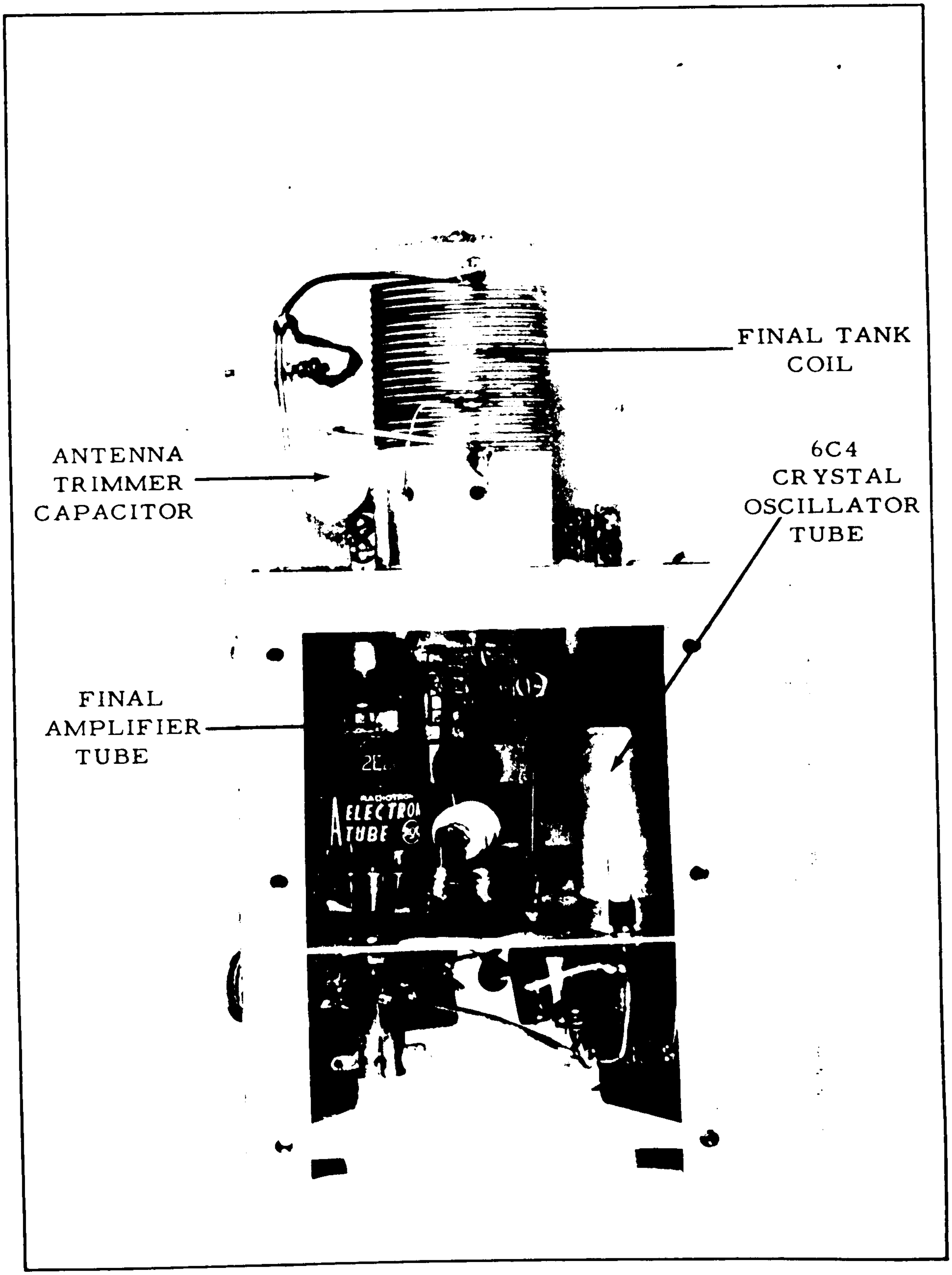


Figure 16. Transmitter.

Self-Balancing Bridge System

Conversion of weather data to code groups is accomplished by means of a "closed-loop" servo system, or self-balancing bridge, in conjunction with a mechanical coding mechanism. (See figure 17.) The servo system consists of an ac bridge circuit, a two-stage amplifier (figure 18), and a two-phase rebalancing motor. One leg of the bridge circuit contains a weather element transducer (R_x), the adjacent leg containing a "rebalance" potentiometer driven by the two-phase motor.

The primary terminals of T101 are connected to the primary winding of the vibrator power supply transformer. The 115 volts developed across the secondary of T101 is applied to the bridge input and to one winding of the two-phase motor. The other winding of the motor is connected to the amplifier output, and a 90° phase relation between the two voltages applied to the motor is obtained by means of a phase-shifting capacitor in the amplifier output circuit.

When the bridge becomes sufficiently unbalanced (approximately 2 ohms change in R_x), the motor rotates the rebalance potentiometer in the proper direction to balance the bridge. The code selector switches rotate with this motor, picking out particular letters for transmission.

Since the time allotted for bridge rebalance is only about 3 seconds, little hunting or instability can be tolerated. Otherwise wrong code letters would be transmitted, resulting in erroneous weather information. Hunting is kept to a minimum in this equipment by allowing some dc to flow in one winding of the two-phase motor, thereby providing a measure of magnetic damping.

Technical data on the design of the bridge circuit are included in the Appendix.

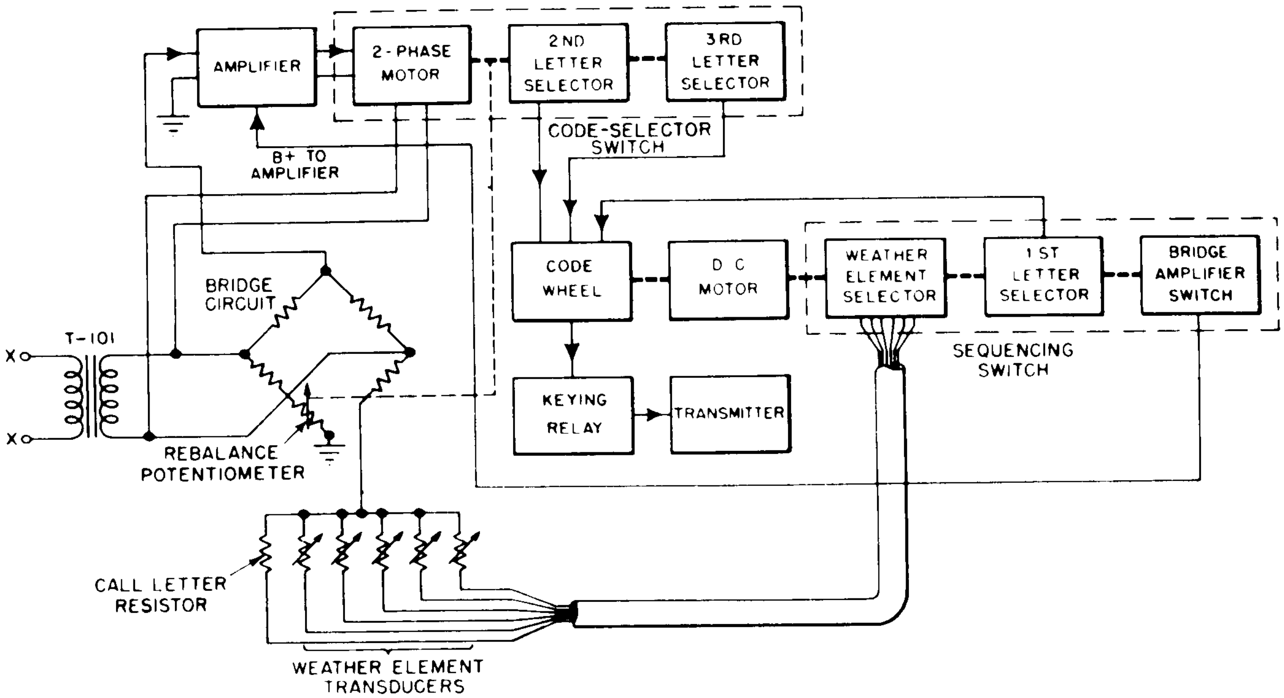


Figure 17. Coding system block diagram.

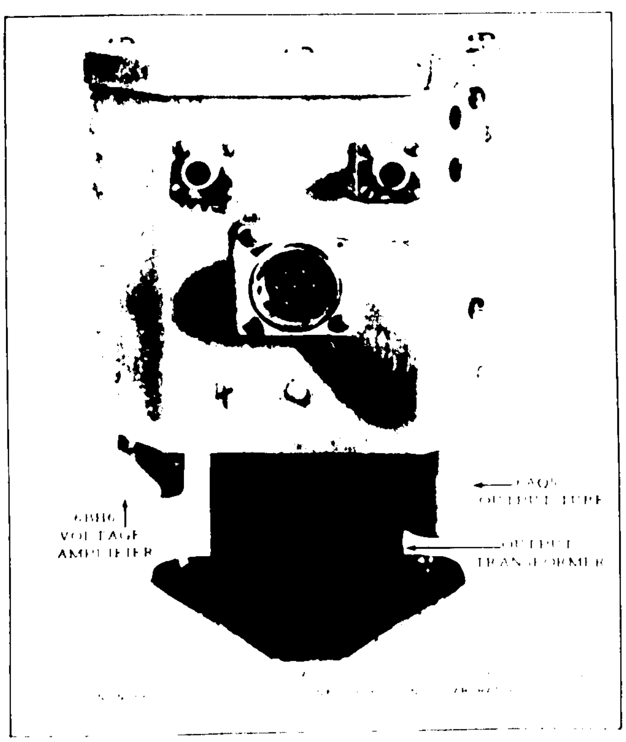


Figure 18. Bridge amplifier

Code-Selection Mechanism

The code-selection mechanism (figures 19 and 20) consists of two mechanical systems which are electrically connected. The lower system includes a code wheel, a sequencing switch, and a cam-operated switch, all operated from a 12-volt dc motor whose output shaft rotates at 17 rpm.

The upper mechanism consists of two 7-contact switches geared together at a 13-to-1 ratio, and in turn geared to a precision rebalance potentiometer. This system is actuated by the two-phase motor which balances the bridge circuit.

The two switches are identical, each consisting of seven contact buttons (metallic segments) and a two-prong switch arm. When the switch arm is touching only one button, the code-selection mechanism sends the letter on the code wheel which is connected to that button. When the arm touches two buttons, as in figure 21, the mechanism sends both letters simultaneously, which results in the formation of a new letter as indicated in figure 22. The buttons are of such a diameter and spacing that the arc length traveled during the time the switch arm contacts a single button equals the arc length traveled while contacting two buttons simultaneously. There are three sets of brushes contacting the code wheel, each set being associated with one letter of the transmitted code group.

The sequencing switch performs several functions. It switches the weather element resistance into the bridge, applies voltage to the rebalancing circuit, and picks out the proper identifying letter for each weather parameter code group. It also switches into the bridge circuit a resistance which caused the coding mechanism to send a call letter identifying the individual weather station.

When the station is transmitting weather information, the first letter of the three-letter code groups identifies the meteorological parameter being sampled, and the last two letters represent the quantitative information.

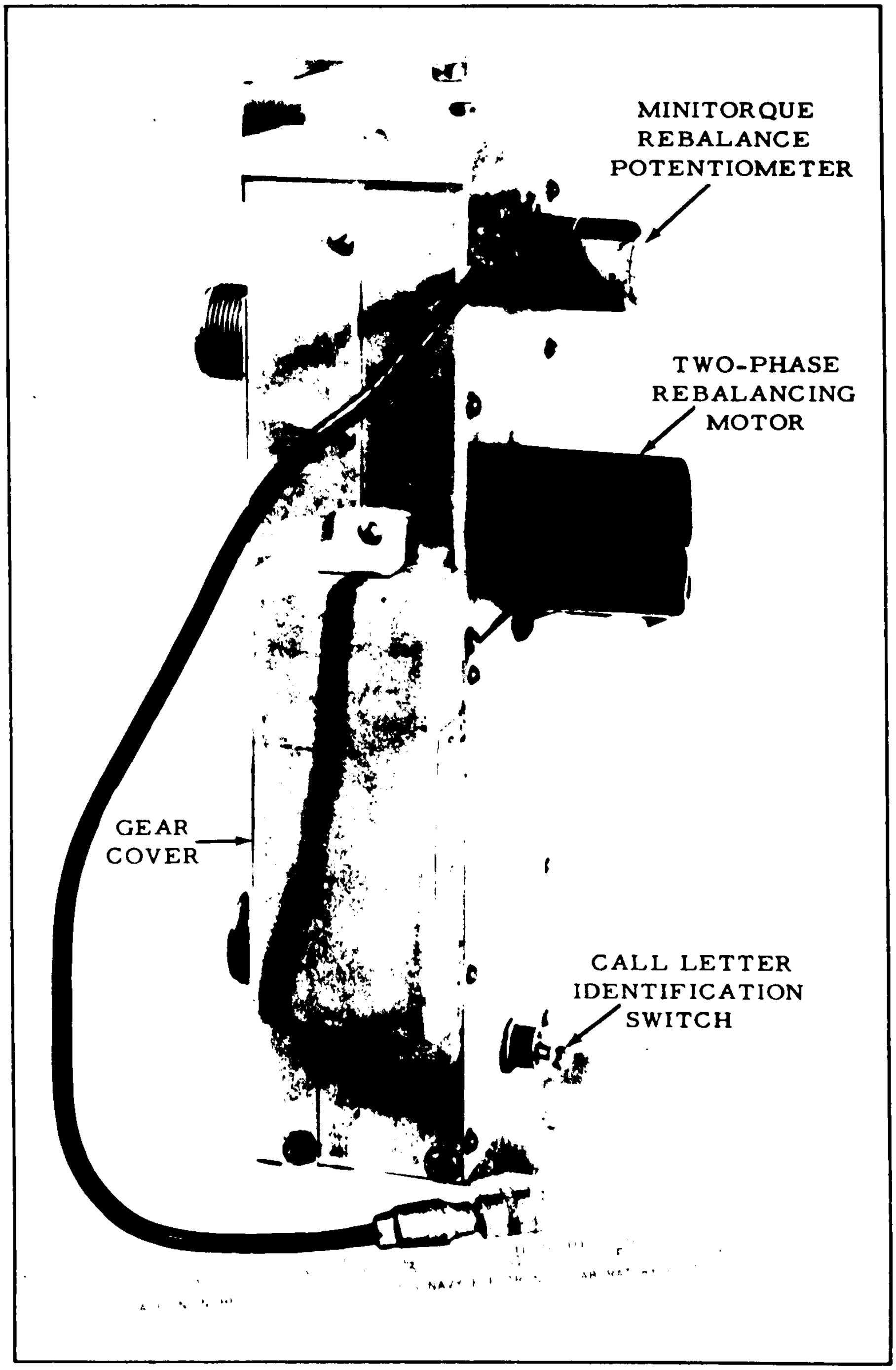


Figure 19. Code selection mechanism (assembled).

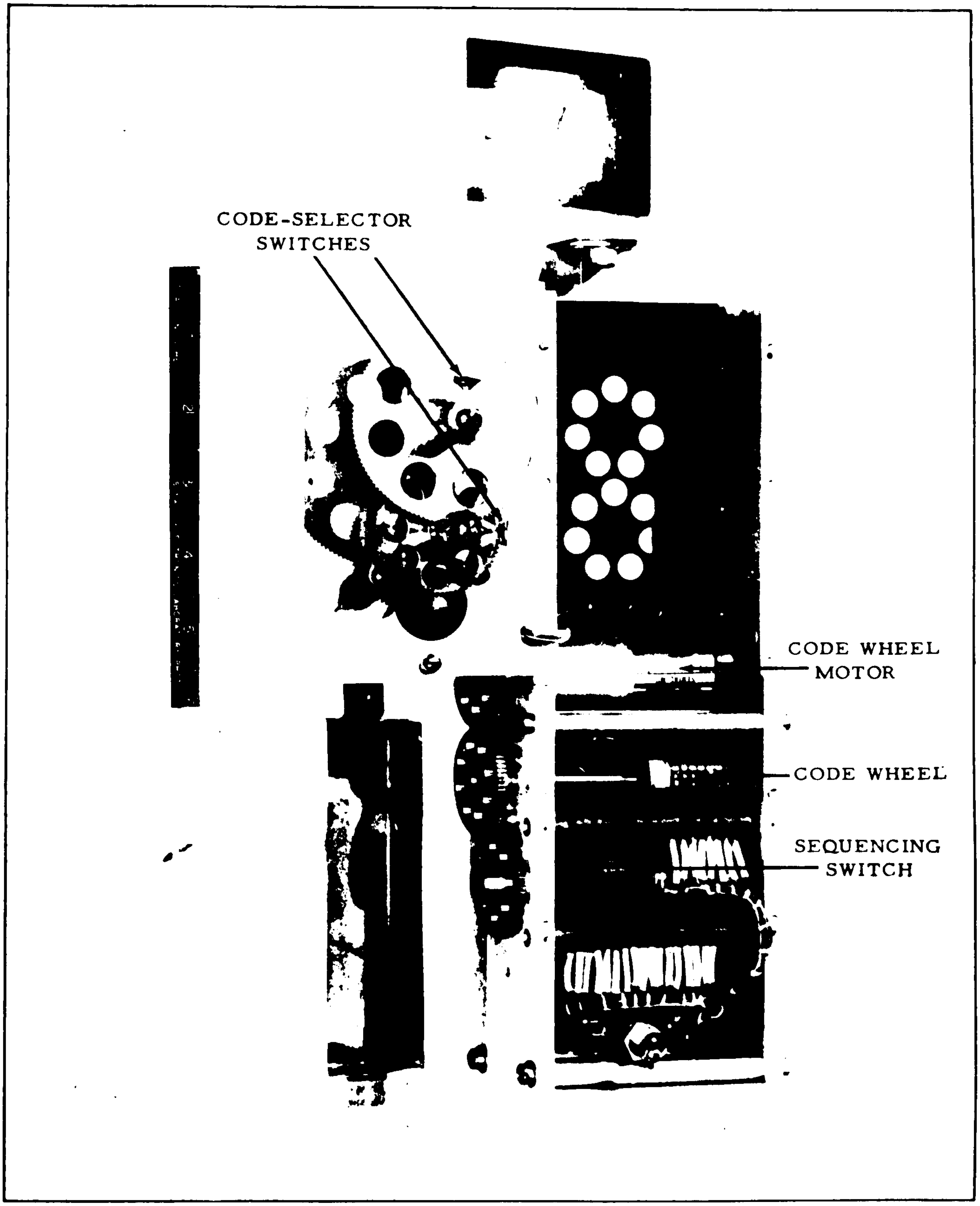


Figure 20. Code selection mechanism (exploded).

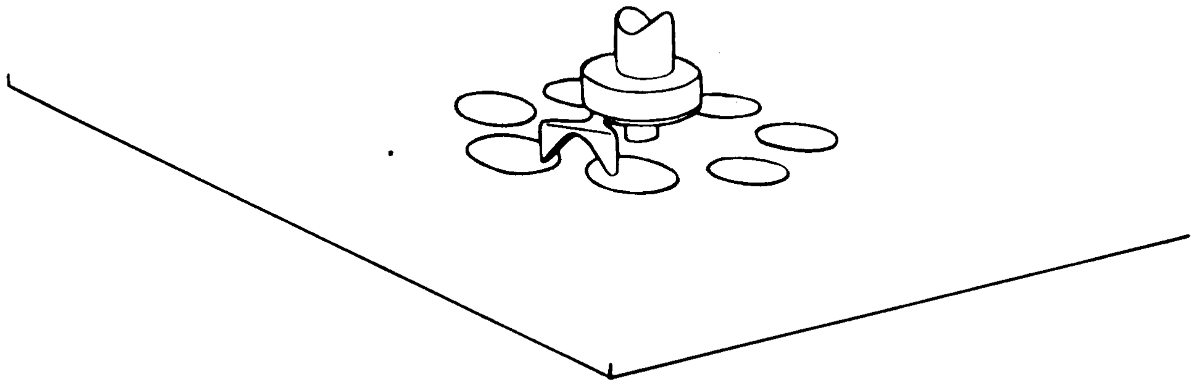


Figure 21. Switch arm contacting two buttons.

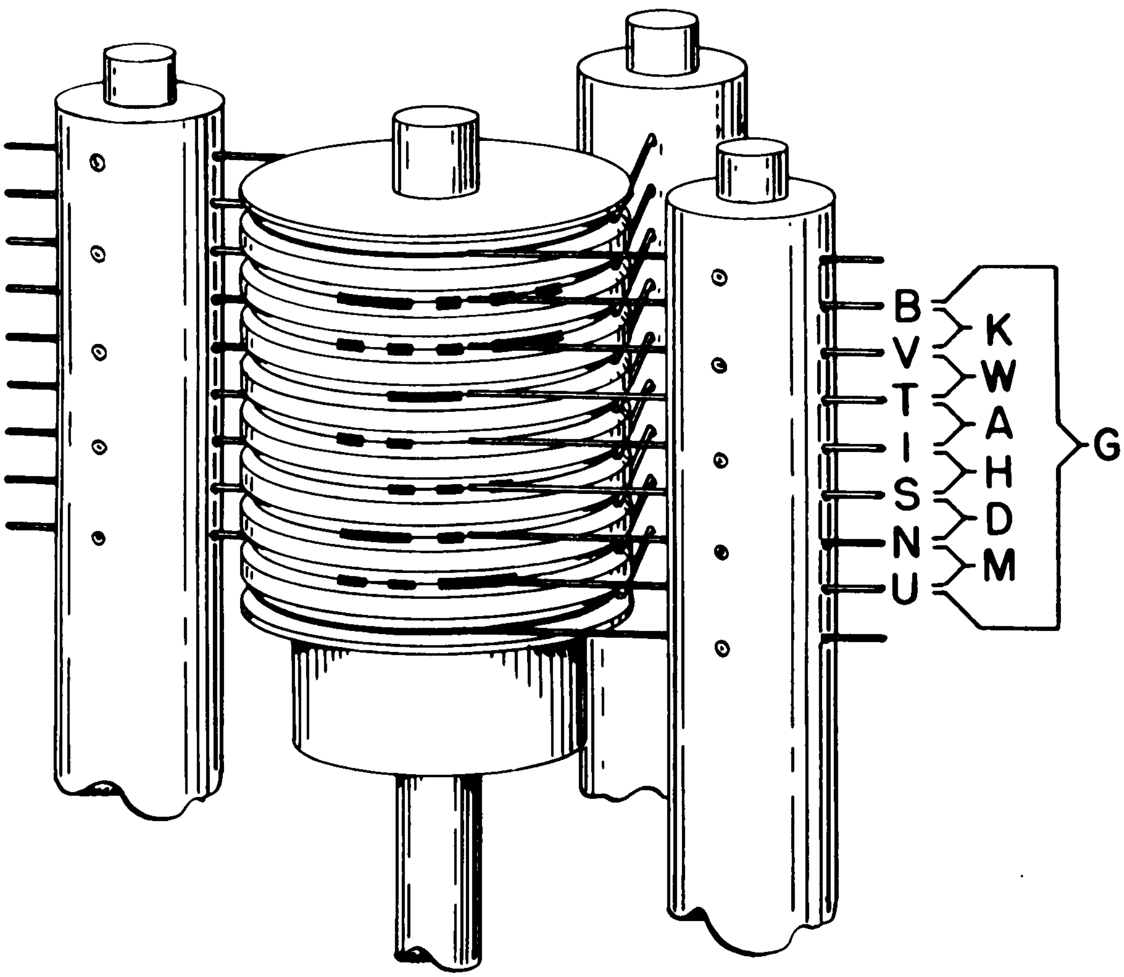


Figure 22. Physical arrangement of code wheel contacts.

Timing Mechanisms

Initiation of all weather-station operations, with the exception of parachute deployment and parachute release, is accomplished by two timers.

A mechanical erection-delay timer, preset to a time dependent on the altitude of drop, is started by removal of a holding wire when the tail cone is ejected from the weather station. After the prearranged time has elapsed and the station is on the ground, the timer contacts close, applying voltage to the leg-release fusible wire. A chain of events follows which has been described in the Sequence of Operations section.

In order to provide for transmission of weather data at regular predetermined intervals, an automobile-type electric clock (Borg No. CA 1656) is arranged with suitable hands and contacts for switching, as shown in figure 8. The clock switch may be set to start transmissions at any 15-minute point, and repeat at regular intervals of 1, 2, 3, 4, 6, or 12 hours. Satisfactory operation of this clock can be obtained at -70°F by cleaning the mechanism and oiling it with a special low-temperature instrument oil (Mellon Institute Oil N-28).

meteorological instruments

Atmospheric Pressure Transducer

This unit (A of figure 23) is an aneroid-type absolute pressure instrument, designed and constructed to NEL specifications by the Bourns Laboratories, Riverside, California.

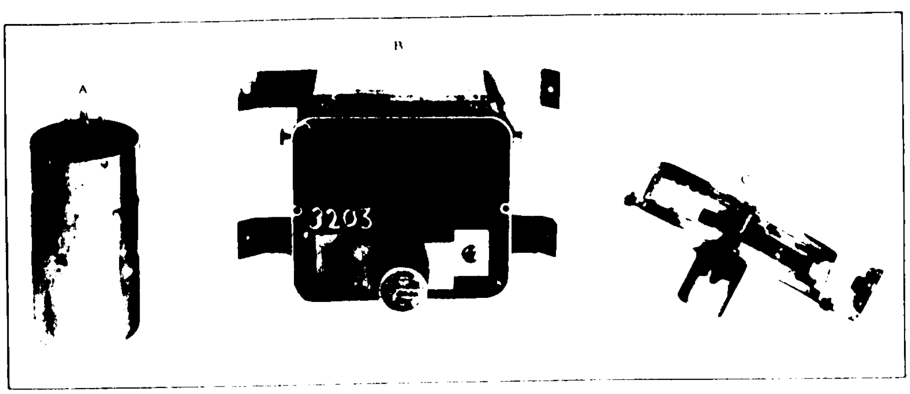


Figure 23. Pressure, humidity, and temperature transducers.

In order to cover the wide range of pressures required, a separate unit is supplied for each 120-mb range, making a total of seven instruments. In operational use, the appropriate unit (based upon a knowledge of the altitude of the proposed operating site) is installed for use in the weather station. Mechanical stops are provided on each pressure instrument to allow transportation at any altitude without damage. Instrument accuracy is within ± 1 mb over the required pressure and temperature ranges.

Graphs similar to figure 10 were obtained for each pressure instrument at several temperatures. These curves allow interpolation of values necessary for temperature correction of the aneroid cell and linkages. The arrowheads on the sample atmospheric pressure calibration curve of figure 10 show that the resistance change is not linear with temperature. Using the high end of the temperature range as a starting point, it may be seen that the trend of increasing resistance with decreasing temperatures actually reverses at some temperature between $+10^{\circ}F$ and $+70^{\circ}F$. It would be highly desirable to eliminate this effect, or at least to restrict any variations with temperature to a very small region, say ± 15 ohms. Both the calibration procedure and the interpolation process would be simplified as a result.

Data on the various temperature corrections required for the meteorological instruments are given in the Appendix.

Relative Humidity Transducer.

A modified membrane-type hygrometer is used for measuring relative humidity. It consists of a Model 201 Serdex instrument (B of figure 23) with a Giannini microtorque potentiometer mounted on the dial face. Mechanical coupling is made between the instrument pointer and the shaft of the potentiometer.

Since the humidity range is covered by a 100° rotation of the pointer, a 5400-ohm, 270° potentiometer is used. A range of 0-to-2000 ohms on the potentiometer then corresponds to 0-to-100 per cent relative humidity.

Recent tests have indicated that some of the Serdex units are by no means precise, stable, and completely reliable instruments. However, the only other device of the mechanical movement type is the hair hygrometer, which is of questionable superiority. Because the Serdex units that were received in early shipments to the Laboratory appeared to be stable and reliable when compared with sling psychrometers, it is possible that the instruments vary from lot to lot. A rigid inspection system at the factory is one recommended step toward the solution of this problem.

Temperature Transducer

This instrument (C of figure 23), designed and fabricated at NEL, consists of a bimetallic strip wound in a spiral, the inside end being fastened to the arm of a Giannini microtorque potentiometer.

The angular movement of the bimetallic strip is such that, for the complete temperature range -70°F to +110°F, the resistance wiper makes approximately two revolutions. Ambiguities arise from this situation, since for every resistance value there exist two possible temperature readings. However, the values are separated by about 100°F so there is little likelihood of misinterpretation.

Detailed information on the properties of the bimetallic material is not available because the units were made of stock of unknown origin. However, the instrument was designed by experimentally obtaining the angular rotation per degree F for a given length of metal. From these data, and a knowledge of the required 3-to-4 degree angular rotation per degree F, the proper length of the coil was obtained. To make the temperature range correspond to the correct resistance range, the instrument was heated to +110°F (upper limit of required range), and the potentiometer housing rotated until a reading of approximately 2000 ohms was obtained.

The accuracy obtainable with this instrument is ±1°F, and the speed of response is as rapid as a thermocouple-type temperature indicator.

Wind-Direction Transducer

This instrument (figure 24) consists of an aluminum wind vane connected to the case of a specially constructed magnetic compass by means of a rotatable shaft. Mounted on the compass case is the frame of a microtorque potentiometer, the movable arm of which is coupled to the compass float. Wind direction is thus established with respect to magnetic north.

The compass case is mounted in gimbals to insure operation in a level position. A brass float containing fifteen 1/8-inch diameter Alnico V magnets provides the required torque to operate the microtorque potentiometer. In order to insure sufficiently low viscosity at low temperatures, Silicone DC200 fluid (whose viscosity is 2 centistokes at 25°C) is used to float the magnet assembly. Alcohol was eliminated as a usable fluid for this application because of its corrosive action. Means for obtaining the variable resistance information are provided by slip rings on the rotatable shaft. This design also allows unlimited rotation of the instrument. The microtorque potentiometer is constructed in such a manner that the wiper arms bridge across the changeover point at the 360° position.

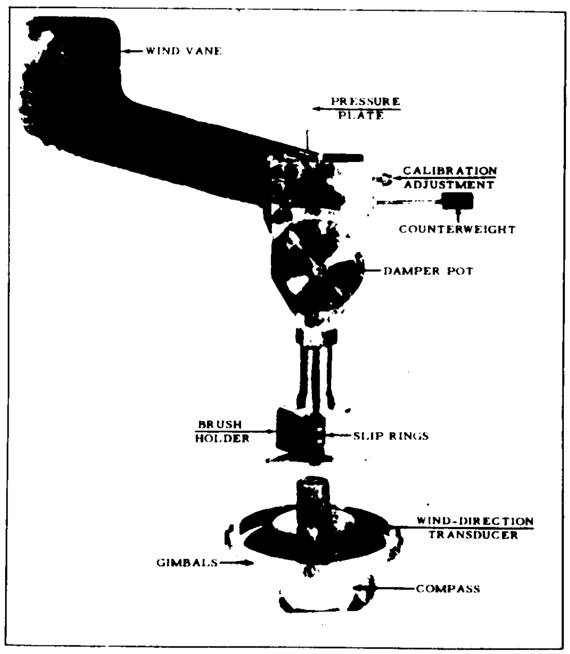


Figure 24. Wind-direction and wind-velocity transducer.

Wind-Velocity Transducer

The wind-speed indicator is an integral part of the wind-direction instrument just described. A "pressure plate," used for measurement of the wind velocity, operates by the force of wind pressure against a flat plate, the plate being displaced against the restoring torque of a spring. This displacement results in the movement of a wiper arm over a resistance strip mounted inside the body of the instrument.

The pressure plate was made as small as possible consistent with the necessary sensitivity. The spring selected has a restoring characteristic such that, over the wind-velocity range of 5-to-80 knots, the total angular movement of the paddle is 45-to-50 degrees. The travel was limited to this amount to minimize errors resulting from winds inclined to the horizontal. In order to provide a more nearly linear angular movement with velocity, the design is such that the spring-restoring torque varies with changes in the moment arm as well as with spring deflection. This is necessary because the pressure on the plate is approximately proportional to the square of the wind velocity.

Since only two samples of wind speed are obtained during each transmission period, a damping device was considered necessary to smooth out the effect of gusts. A suitable fluid-type damper was designed, using Silicone DC200 as the damping medium. In order to provide a reasonably uniform damping constant over a wide temperature range, two fluid viscosities are used; 20 centistokes from $+110^{\circ}F$ to $0^{\circ}F$, and 5 centistokes from $+40^{\circ}F$ to $-70^{\circ}F$.

Packing around the bearing used in this unit is not practical because of the small force available at low wind velocities. However, leakage of the damping fluid can only occur when the weather station is in such a position that the pressure plate is underneath the damper pot. Normally the weather station is never in this position with the exception of the few seconds immediately after it hits the ground, or in the event it is improperly packed.

Figure 25 shows the weather station with all of the associated components installed in their proper positions.

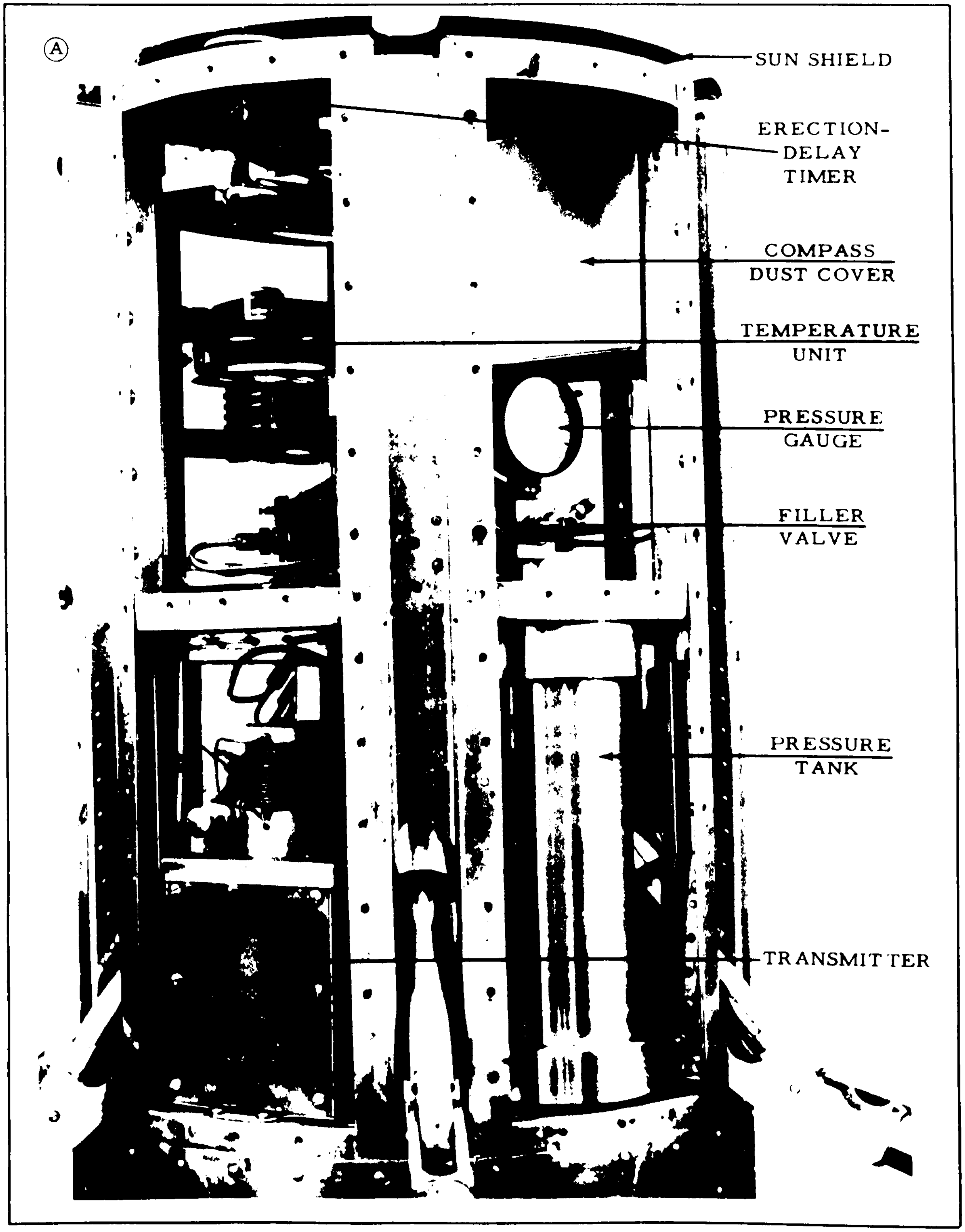
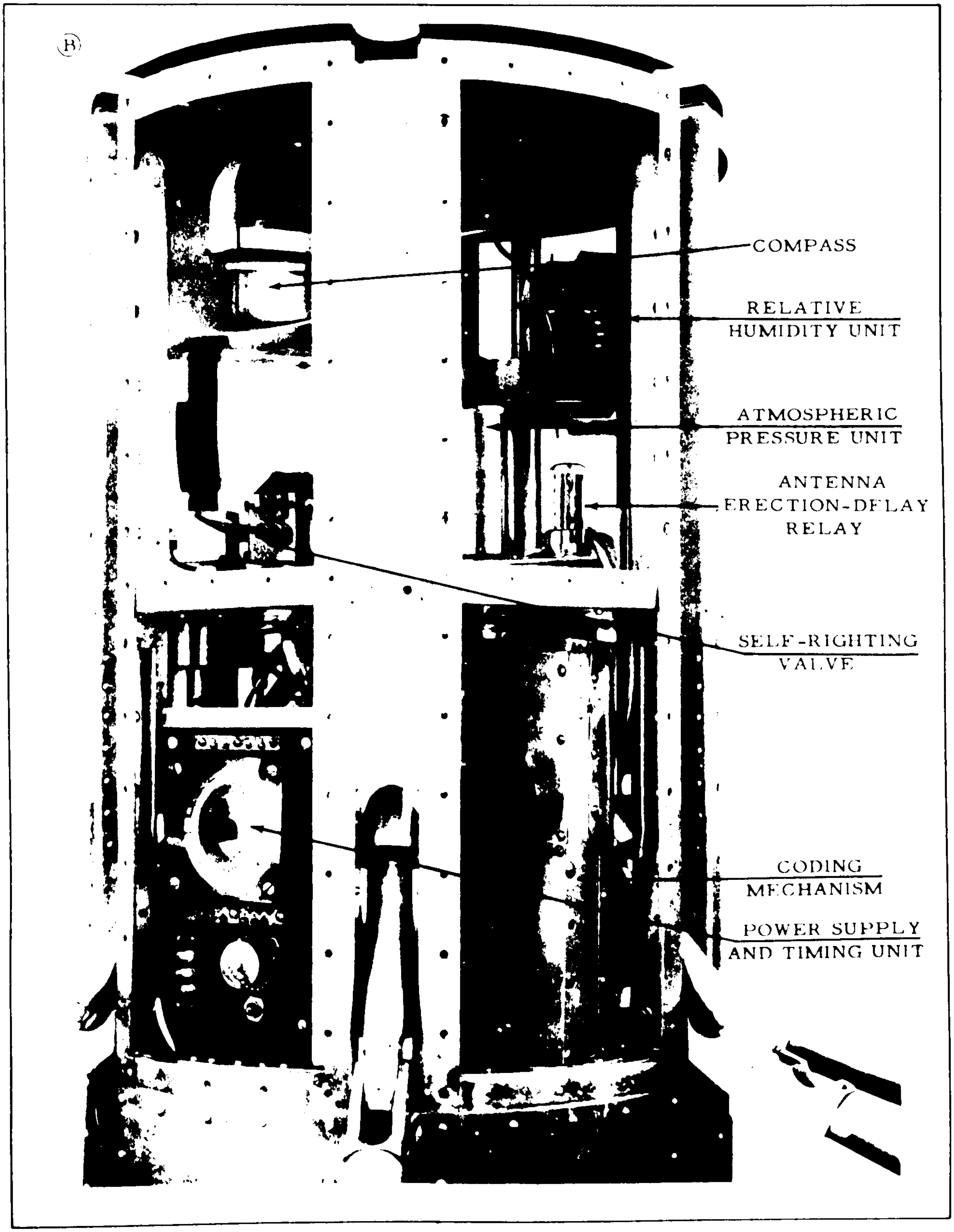


Figure 25. Components installed in weather station.


B
COMPASS
RELATIVE HUMIDITY UNIT
ATMOSPHERIC PRESSURE UNIT
ANTENNA ERECTION-DELAY RELAY
SELF-RIGHTING VALVE
CODING MECHANISM
POWER SUPPLY AND TIMING UNIT

TESTS

controlled atmosphere tests

Tests that were performed on the weather station or its components under controlled atmospheric conditions can be divided into three categories: (1) meteorological instrument calibration, (2) electronic instrumentation tests, and (3) low-temperature operation of the complete weather station.

Instrument Calibrations

The temperature transducers were calibrated in a Bowser chamber using two thermocouples; one being a reference junction held at $0^{\circ}C$ in an ice and water mixture, and the other placed inside the chamber at the existing temperature. The difference voltage was then read by means of a Leeds and Northrup potentiometer to find the chamber temperature. This method provided calibration points with an accuracy of approximately $\pm 0.1^{\circ}F$.

Rechecking the transducers after a lapse of several months showed a shift of about $2^{\circ}F$ in the calibration in the low-temperature region. This was attributed to insufficient artificial aging of the instrument prior to calibration. Future designs should include an adequate cycling period to insure that all stresses have been removed from the bimetallic strip.

Calibration of the Bourns atmospheric pressure transducer was made in a similar chamber, using a water manometer for differential pressure measurement, and a mercurial barometer for reference pressure. An accuracy of approximately ± 0.2 mb was obtainable by this method. Curves were obtained at four temperatures over the required range, allowing interpolation for any particular temperature.

Early attempts to calibrate the Serdex hygrometers in a chamber were completely unsatisfactory, and it was found that special precautions had to be taken to obtain reasonably reliable data. Since the available chamber was inadequate for this type of calibration, a modification was made to reduce the possibilities of moisture stratification in the chamber and to reduce the effects of evaporation from a wet bulb into air flowing past the hygrometers. This modification consisted of screening off a portion of the chamber so that air flowing toward the exhaust vents had to go through a metal tube containing the

Serdex hygrometers. Wet- and dry-bulb thermocouples, connected to a Leeds and Northrup potentiometer, were placed at the exhaust end of the tube. Adequate and continuous soaking of the wet bulb was obtained by the use of gravity feed. The wet-bulb thermocouple was placed on the downwind side of the dry bulb so that no additional moisture was added to the air before temperature measurement. Calibration accuracy was believed to be well within the required ± 5 per cent relative humidity. Checks made with a sling psychrometer under local atmospheric conditions resulted in a scattering of points. However, by drawing a curve using the large number of points obtained by both methods, it was found that 89 per cent of these points were within ± 7 per cent relative humidity of the curve.

With more accurate calibration facilities, it is quite possible that further tests would yield points well within the ± 5 per cent allowable tolerance.

Wind-speed and wind-direction transducers were checked at $-70^{\circ}F$ for freedom of movement and change of damping-fluid viscosity only. Operation of these instruments was considered satisfactory when DC200 Silicone fluids were used.

Electronic Instrumentation Tests

Temperature compensation of the bridge circuit was required (see Appendix). The effectiveness of the calculated temperature coefficients of the bridge resistors, R403 and R404, in maintaining this required temperature compensation was checked in a test chamber. This was done by placing all the weather station components in the chamber, substituting a 2030-ohm microtorque potentiometer for the weather transducers, and noting the transmitted code letters as the temperature was varied over the complete range, $-70^{\circ}F$ to $+110^{\circ}F$. The observed variation of 7 ohms in the indicated resistance was considered satisfactory, since the average resistance change necessary to cause a change in the code letters is 15 ohms.

Upon testing the erection-delay timer and automobile-type clock at $-70^{\circ}F$, it was found necessary first to clean these units carefully and then oil with Mellon Institute N-28 low-temperature oil to insure satisfactory operation.

The complete electronic system, consisting of self-balancing bridge, transmitter, power and timing unit, and code selection mechanism, functioned properly over the complete temperature range, $-70^{\circ}F$ to $+110^{\circ}F$.

Operation of the battery was tested at -70°F for several days in an accelerated life test. The battery furnished current to a load equivalent to the weather station requirements for a time equal to a normal two-week operational period. At the end of this period the battery voltage was approximately 10 volts.

Weather Station Low-Temperature Tests

Since a chamber of adequate size to test the entire weather station was not available at NEL, the altitude test chamber at the U. S. Naval Ordnance Test Station, Inyokern, China Lake, California, was utilized for this purpose. The original intent was to make comprehensive tests over a wide range of temperature, humidity, and pressure, but, because all the Navy acceptance tests for the chamber had not been passed, only low-temperature and variable-pressure tests were made.

The station was placed in the chamber, and the temperature reduced to -70°F. The weather station pressure tank was then filled to 1200 psi. An aircraft climb to 18,000 feet was then simulated by appropriate pressure-change rate, followed by a return to local pressure at a rate corresponding to a parachute descent. At this time the timer pin was removed, and after the prescribed delay the leg mechanism operated, righting the station. After the proper time delay, the antenna release operated, blowing out a stopper placed in the bottom antenna section, thereby indicating satisfactory operation of the valve assembly. Wind-direction and wind-velocity instruments were checked and found to move freely. The battery voltage available at -70°F with the high specific gravity electrolyte was 13.1 volts open circuited, and 11.8 volts with all equipment in operation. No difficulty was encountered with the operation of the electronic components.

snow tests

The object of these tests was to subject the station to snowstorms and high winds, and to observe the erection of the equipment in snow. Although the weather station was not ready until mid-April 1950, it was transported to Donner Summit, California (elevation of 7000 feet), where about 12 feet of snow cover existed (see figure 26), and was erected in time to be tested in one of the most severe snowstorms of the season.

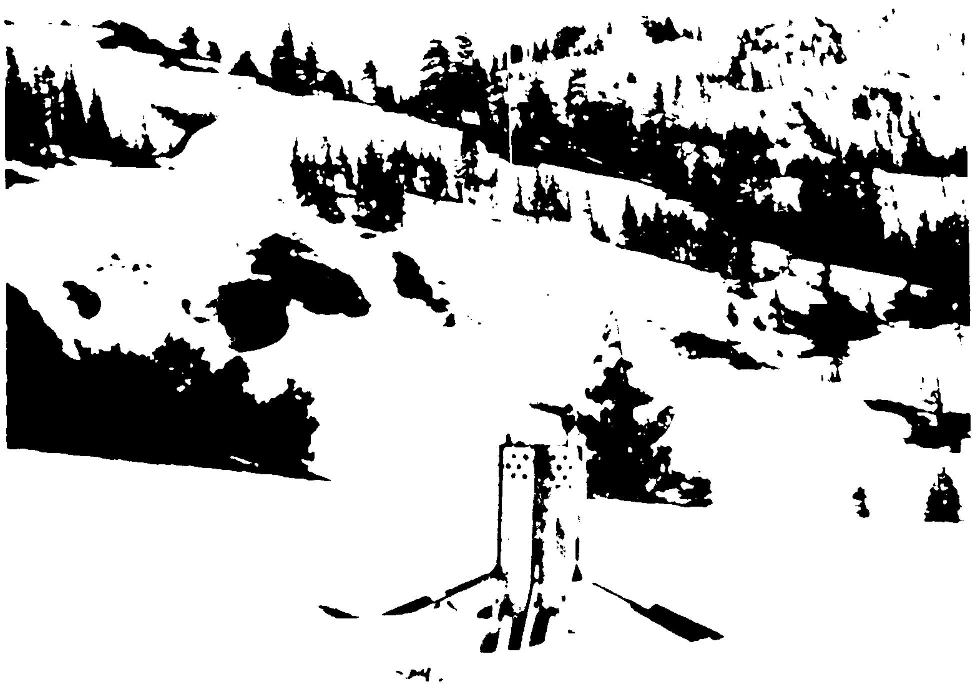


Figure 26. Weather station at Donner Summit.

Observation of the station erecting itself in the snow revealed that the stabilizing fins, which were permanently attached to the legs, dug into the snow and prevented the legs from locking in place. Therefore, at a later date, fins were developed which fall free when the legs fold outward.

The station was set up on a slope about 150 feet from the Donner Summit weather station operated by the CAA. This site was chosen so that weather data gathered at regular intervals by CAA personnel could be used for comparative purposes.

Some trouble was experienced with the wind-velocity, wind-direction, and humidity instruments that was not directly attributable to the weather conditions. These tests, therefore, did not yield as much quantitative information about the instruments as was desired. However, considerable knowledge of the special problems encountered during operation on snow-covered mountainous terrain was gained, and improvements in the weather station resulted.

The principal mechanical difficulties that were encountered during the snow tests were:

1. The wind-velocity pressure plate became stuck. This was attributed to a warping of the plastic damper case.
2. The compass bowl jammed in a vertical position during transit.
3. Damage occurred to the wind-indicator slip ring brushes.
4. Alcohol, which was used at that time for floating the compass, evaporated rapidly.

As a result of these failures, the comparison of wind-velocity and wind-direction information with the Donner Summit data was largely meaningless.

It was noted during the storm that, after a time, snow and sleet would cling to the pressure plate. This undoubtedly changes the calibration of the instrument, if the area of the plate is appreciably altered. In the case of severe icing, it is believed that all presently practical methods of wind-velocity measurement (where large amounts of electrical power are not available) have severe limitations.

No other specific difficulties were attributed to the wind-driven snow, although several inches of snow accumulated in the meteorological compartment.

Atmospheric pressure measured by the Bourns pressure transducer was within ± 1.5 mb of the CAA data for 54 of the 56 measurements.

A major problem brought to light by these tests was the inadequate ventilation provided for the temperature and humidity transducers. On bright sunny days under conditions of very little wind, the temperature inside the weather station reached a point as high as 25°F above the outside air temperature, and the relative humidity dropped as much as 60 per cent below normal. The conditions prevalent at Donner Summit were considered a severe test of this problem because of the highly reflective snow, low air density, and periods of low wind velocity. Near the end of the tests, the ventilation was greatly increased by removing all access panels from the weather station, thus allowing much greater air circulation. Specifically, during a 1-day test period under these conditions, the maximum temperature difference registered by the station from the outside weather conditions was 3°F, and the maximum humidity change was 12 per cent.

As a result of these tests, two louvered panels and four ventilation air scoops were constructed for the station, as shown in figure 1. In addition, a false deck of polished aluminum supported by insulating spacers was attached to the former top deck, providing additional protection from the sun.

Recent laboratory tests have shown that the increase in temperature inside an aluminum cylinder resulting from solar radiation is reduced when the outside surface of the cylinder is painted with white enamel. The reason for this is that, while the coefficient of absorption of the white surface (for solar radiation) is not as low as polished aluminum, its low-temperature emissivity is considerably higher.

Quantitatively, a white enamel surface has a coefficient of absorption of about 0.25 for solar radiation, while the same quantity for aluminum has a value of only 0.15. Further, the coefficient of emissivity (for low temperatures) of the white surface is 0.95 as compared to about 0.08 for aluminum.[2]

It should be noted that the polished aluminum surface inside the weather station should be retained so that radiation from the warm walls toward the instruments will be kept to a minimum.

parachute drop tests

Over a period of eighteen months, three weather stations were subjected to a total of approximately 20 drops from an F8F aircraft by the Parachute Experimental Unit, El Centro, California. The drops were made from 1500 feet at speeds ranging from 150-to-225 knots.

For the most part, very little trouble was experienced with damage as a result of the drop tests. Several plastic battery cases were cracked before improved packaging was devised, and, on one occasion, a leg and the wind vane were bent as a result of improper stabilizing-fin design.

Early drop tests were made with development models of the electronic equipment installed, and with only one or two experimental meteorological instruments in place. Tests of a complete weather station began in September 1949. Several months later, a failure occurred when the station was dropped under conditions of high surface winds (25-to-30 knots).

Because of malfunctioning of the bomb shackle release system on the aircraft, the station was dropped near one end of the landing field, and the equipment landed outside the Air Station. The surface wind was so strong that sufficient relaxation of tension in the shroud lines did not occur. As a result, the parachute-release device failed to operate, causing the weather station to be dragged about 1/2 mile across open fields. The only observed damage resulting from this rough treatment was relay failure due to dirt on the contacts. Hermetically sealed relays were later installed to preclude a repetition of this failure. The parachute-release assembly was modified by the substitution of a stronger spring of improved design for forcing the hook to release. Satisfactory release was obtained with this modified hook in a series of tests where surface winds of up to 30 knots prevailed. An additional safety feature later incorporated in the equipment was a design providing for the support post to which the ground-release assembly is attached to be automatically ejected at the time that the legs start opening.

Considerable trouble was experienced with aerodynamic instability of the weather station in the early phases of drops from wing racks. On one occasion, when stabilizing fins were not used, violent longitudinal oscillation of the equipment occurred while the parachute was deploying, causing the main hook connecting the station and parachute to snap. Various types of permanently attached fins were successfully used during early stages of the equipment development. However, disadvantages associated with these designs were (1) reduced accessibility to inner compartments, and (2) susceptibility to jamming when the station erects in snow. Consequently, fins were designed that are held in place by the leg chaps, dropping free of the station when the legs unfold on the ground.

CONCLUSIONS

1. An automatic weather station has been developed which can be carried by military aircraft on standard external or internal bomb racks, and dropped to the ground by parachute at a remote point. The station will then automatically transmit surface weather data: namely, atmospheric pressure, temperature, relative humidity, wind speed, and wind direction.

2. The weather station transmissions can be received by standard ship, shore, or aircraft radio receivers with no auxiliary recording equipment required. Information is trans-

mitted in three-letter code groups which can be readily converted to weather data by means of simple charts.

3. Reception of the weather station transmissions at various ranges is dependent upon ionospheric propagation characteristics. Since only one frequency (5072.5 kc) was assigned to this equipment, severe limitations have been imposed on wide-area coverage. As an example of the possible range, however, the weather station transmissions were received satisfactorily during night hours over a 500-mile path for a 2-week period during the spring of 1950.

4. At -70°F the special purpose, lead-acid type storage battery (electrolyte sp gr of 1.350) has sufficient capacity to allow a 3-minute transmission every 6 hours for a period of 2 weeks. At higher temperatures a corresponding increase in operating life can be expected.

5. Readings obtained from the temperature and atmospheric-pressure transducers are within the accuracy specified in the problem assignment ($\pm 2^{\circ}F$ and ± 1.5 mb, respectively).

6. A determination of the accuracy of the other three meteorological instruments over a wide range of conditions was limited by available testing facilities. However, the following conclusions can be stated:

a. Over the temperature range +50°F to +110°F, the Serdex hygrometer readings are accurate to within ± 7 per cent relative humidity from 15 per cent to 95 per cent relative humidity. No adequate facility was available for varying and accurately measuring relative humidity at low temperatures.

b. The wind-speed indicator will provide readings within the required accuracy over the range 5-to-80 knots. However, the calibration was performed at temperatures in the range +60°F to +85°F. Although no facilities were readily available for checking the calibration over a wide range of temperature, no appreciable change in calibration is anticipated at other temperatures.

c. The wind-direction indicator is basically capable of providing information within the required $\pm 7^{\circ}$, using magnetic north as a reference. It should be noted that, when operating in high latitudes where magnetic compasses are unreliable, or where the terrain immediately surrounding the weather station is unknown, the wind-direction information will be of little value.

7. Continuous wave (CW) was chosen as the method of transmission, rather than a form of pulse modulation which might be termed "pulsed CW" (transmission in which each dot and dash is broken up into pulses occurring at an audio rate). This decision was based on the comparative simplicity of a CW transmitter, and the fact that frequency diversity, which is the principal advantage of "pulsed CW," is of reduced importance in this application because of the numerous repetitions of each code group.

8. The total weight of the weather station, including the parachute, is 176 pounds.

RECOMMENDATIONS

The items listed below are recommended measures to be taken for improving the design and calibration of the equipment.

1. Make the following additional tests where facilities are available:

   a. Check the calibration of the hygrometers at temperatures below +32°F.
   b. Check the wind-speed indicator calibration over the complete operating temperature range.
   c. Determine the accuracy of the automobile-type clock at -70°F.
   d. Test operation of the station under conditions of heavy rainfall and high winds.

2. Conduct additional operational tests in mountainous country under snow conditions similar to the limited operations made by NEL at Donner Summit, California.

3. Upon completion of the construction of an adequate number of weather stations (10 or more), perform operational service tests which include:

   a. Drop tests in mountainous terrain (1) at several surface elevations, (2) on soft snow surfaces, and (3) on snow crust.
   b. Tests in Arctic regions.

4. Determine the feasibility of using aircraft photographic techniques for obtaining a reference direction for wind-direction measurements. Pictures of the weather station erected on the ground, taken from an aircraft flying on a known heading, would reveal the physical orientation of the station with respect to this heading. Such orientation could then be correlated with the transmitted data to give wind direction relative to the known heading. Suitable marking on one leg chap of the station would provide identification of a reference position in the photograph.

5. Investigate methods of inlaying contacts in insulating material, such as used in the Signal Corps Radiosonde Modulator ML-310/AMT-1. This method appears applicable to the code wheel, sequencer, and clock contacts of the weather station, and should result in improved construction techniques for these components.

6. Investigate the possibility of using a chemical paste or oil, similar to that employed extensively by the R.A.F. during the last war, for anti-icing of the wind-speed indicator and antenna.

7. In rewriting specifications for the barometer units, emphasize the accuracy gained by recording atmospheric pressure changes rather than absolute pressure values. If the altitude of the operating site is not known to within ± 100 feet, an error amounting to more than ± 2 mb can result.

8. Replace the present 12-volt battery with a 14-volt unit of the same type designed with a form factor to fit in the outside battery box. This will necessitate changing a gear ratio in the sequencing unit to keep the same code speed. Use of the higher voltage battery will result in a more efficient operation of the transmitter during the latter part of the operational period.

9. Relax accuracy limits of relative humidity measurement from ± 5 per cent relative humidity to ± 7 per cent relative humidity in the temperature range between $+32^{\circ}F$ and $+110^{\circ}F$. Further investigation with more accurate calibrating equipment may prove this to be unnecessary.

10. Investigate the advisability of keeping the Serdex hygrometers in a humid atmosphere when stored for long periods of time.

11. Determine the reasons why the Serdex instruments occasionally jam when the actual humidity is less than 10 per cent.

12. Determine the most effective baffling for temperature and relative-humidity transducers under conditions of high wind.

13. With the aid of an experienced manufacturer of bimetallic materials, determine the optimum design of the coil used in the temperature transducer. Optimizing the design should result in a coil: (a) heavy enough to withstand high winds, (b) light enough to keep the time lag short, and (c) having the lowest possible hysteresis effects.

14. Investigate the possibility of coating the weather station side panels with an aluminum foil over a plastic foam insulating material. This should further reduce the heating effect of the sun.

15. Use a shielded, stainless-steel ball bearing in the exposed position of the wind-velocity indicator.

16. Determine if materials such as Silicone rubber are usable as a shock absorber in the weather station. The plastic ball now used for this purpose becomes brittle at very low temperatures. "Poly-foam" material should also be investigated as a possible shock-absorbing medium. (Impact area of the poly-foam would have to be small to be effective.)

17. For efficient operational use of the automatic weather stations, employ personnel skilled in the application of ionospheric propagation data for determining skip zones and related transmission problems.

18. Change the specification for erecting on slopes from the present requirement of 45° to 30°. It is believed that a 30° slope is the maximum on which the equipment will stop. The compass in the present station is designed on the basis of a 30° maximum slope.

19. Make further tests to determine the effectiveness of the white enameled exterior under different ground surface conditions, including snow. Such an investigation will reveal the usefulness of the white surface when there is a large amount of heat radiated from the ground to the weather station.

APPENDIX: TEMPERATURE COMPENSATION AND CORRECTION

bridge circuit design

It may be seen by referring to figure 27 that the bridge circuit employed in the weather station consists basically of the two fixed arms, R401 and R402, and two variable arms, one containing the rebalance potentiometer, and the other containing a weather-element transducer. For maximum sensitivity of the bridge,[1] R401 = R402, and R403 + $R_{transducer}$ = R404 + R201. An approximate value of resistance was chosen for R403 (exact value depends upon temperature coefficient considerations), limiting the maximum current through any weather-element transducer to 15 milliamperes.

R403 and the weather-element transducer compose one leg of the ac bridge, the other variable leg consisting of R404 (3545 ohms) and R201. R201 is a specially constructed 360° minitorque potentiometer. The first 225 ohms (30° rotation) of R201 plus R404 matches the value of R403 (3770 ohms) in the adjacent leg of the bridge. This arrangement is such that when the resistance of the weather-element transducer is at zero ohms (point X) the arm of potentiometer R201 is at point Y. The 2250-ohm portion (300° rotation) of R201 corresponds to the variable resistance of the transducer. The last 30° rotation of R201 is an open circuit. This open-circuited portion provides a region for

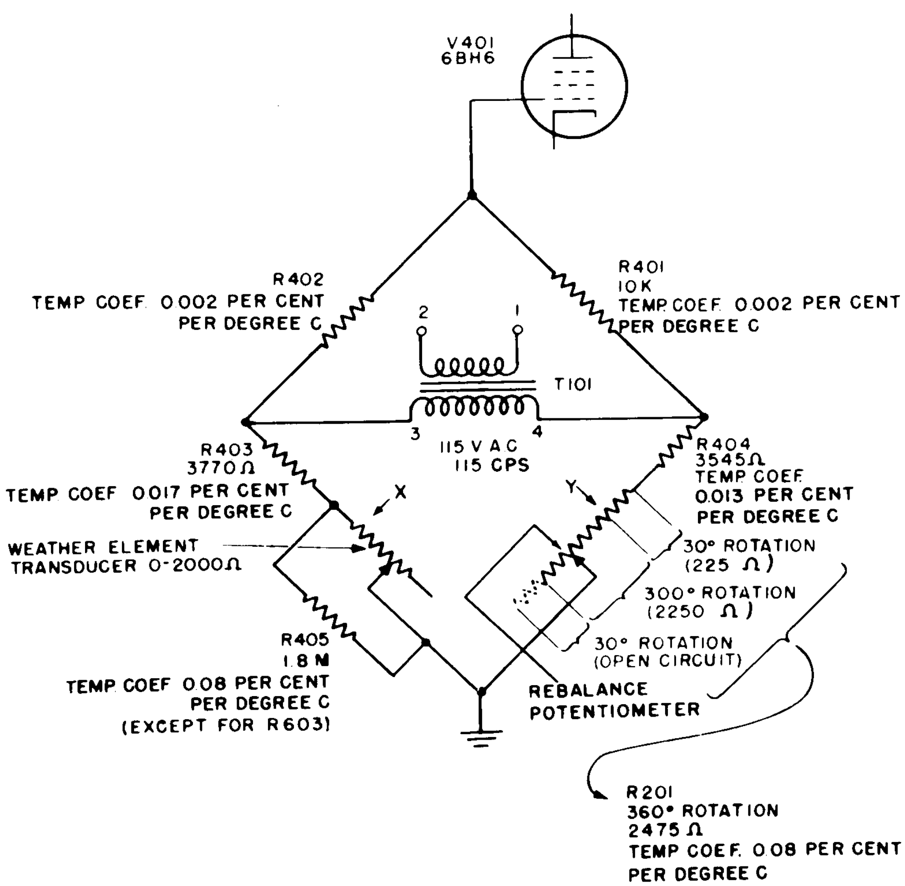


Figure 27. AC bridge circuit.

overshooting when the rebalance motor is rapidly turning the potentiometer to a high value of resistance. When the inertia of the motor carries the potentiometer arm over into the open-circuited region, a strong reverse torque is applied to the motor, tending to brake its motion and cause a reversal of direction. This reduces the shock on the gear train by lessening its impact against a mechanical stop.

Precaution against excessive shock is also provided if a meteorological instrument develops an open circuit. A reverse torque is applied in this case because R405 (1.8 megohm) is paralleled with these instruments. When the motor drives R201 rapidly toward a balance position of 1.8 megohm, the arm of R201 suddenly goes into the open-circuit region. This means that a reverse torque is applied, braking the motor and causing a temporary reversal of direction. Under these conditions, hunting will occur at the end of the resistance strip, and the code selector switches may stop at random points in this region. If scattered readings occur in the vicinity of 2200 ohms, an open circuit in one of the meteorological instruments should be suspected.

temperature compensation

The mean temperature coefficient of the microtorque potentiometers used in the weather-element transducers and the minitorque rebalance potentiometer R201 is 0.08 per cent per degree C.

As was previously mentioned, the series value of the first 225 ohms of R201 plus R404 (3545 ohms) is matched by the single resistor R403 (3770 ohms) in the adjacent variable leg. In order to ensure that the value of R403 and the value of R404 + 225 ohms vary in exactly the same way over the temperature range $-70^{\circ}F$ to $+110^{\circ}F$, it is obvious that some means of temperature compensation is required. This is accomplished by choosing different temperature coefficients for R403 and R404 in the following way:

The condition for proper temperature compensation can be written as

$$225(k_1) + R404(k_2) = R403(k_3), \tag{1}$$

where k_1 is the mean temperature coefficient of the microtorque potentiometers (0.08 per cent per degree C),

k_2 is the mean temperature coefficient of one commerical precision resistor (0.013 per cent per degree C),

k_3 is the mean temperature coefficient of the other commercial precision resistor (0.017 per cent per degree C), and

R403 = R404 + 225 ohms.

Substituting the proper values in equation 1 gives

$$225(0.0008) + (R404)(0.00013) = (R404 + 225)(0.00017). \quad (2)$$

R404 is evaluated from equation 2 as

R404 = 3543.8 ohms.

Letting R404 = 3545 ohms, results in

$$R403 = 3545 + 225 = 3770 \text{ ohms}. \quad (3)$$

temperature corrections

The code-selection mechanism, wind-speed indicator, wind-direction indicator, and relative humidity transducer were all calibrated at approximately $+70^{\circ}F$. Furthermore, the variable resistances associated with these meteorological instruments and the code-selection mechanism all have the same temperature coefficient. As a result, no temperature correction is required. However, the atmospheric pressure transducer and the temperature transducer must be calibrated over the range $-70^{\circ}F$ to $+110^{\circ}F$, and appropriate temperature corrections must be made.

In the case of the atmospheric pressure instrument, several graphs are obtained by holding the test chamber at given temperatures and varying the pressure over the required range. These graphs compensate for the fact that expansion and contraction of the bellows and linkages are functions of temperature. A correction must now be applied because the coding mechanism was not calibrated at those temperatures. When the ambient temperature of the weather station is above $+70^{\circ}F$, the resistance correction must be added to the transmitted value, and when the temperature is below $+70^{\circ}F$, the correction must be subtracted. The applied correction is supplied in the form of a chart, and consists of values calculated on the basis of a mean temperature coefficient of 0.08 per cent per degree C.

If the code letter versus resistance chart (table 2) is used directly with the pressure instrument calibration curves, an erroneous reading will be obtained when the air temperature is above or below +70°F. For example, if we assume that the temperature is +100°F, it can be seen that the code letters transmitted will indicate a resistance that is too low by an amount equal to the indicated resistance times the mean temperature coefficient. Therefore, this amount must be added to the transmitted value of resistance before entering the instrument calibration curves. The reason for the transmitted value being too low is that the angular positions of the code selector switches (and thus the code groups sent) correspond to a lower value of resistance (as shown on code letter versus resistance chart) instead of the actual resistance at this higher temperature.

To carry the example a step further, it can be seen that at a given pressure and a temperature of +100°F, the bridge will balance so that the rebalance potentiometer resistance is equal to the transducer resistance. If this resistance is 2000 ohms, the code selector will select a code group corresponding to 1973 ohms, which is 2000 ohms referred to +70°F. It is therefore necessary to add the temperature correction to this transmitted value to obtain the proper resistance.

The temperature transducer is first calibrated over the complete temperature range, and the resulting graph is modified in the following manner: For temperatures above +70°F, the resistance values are corrected by <u>subtracting</u> values based on a mean temperature coefficient of 0.08 per cent per degree C, and for temperatures below +70°F, the corrections are <u>added.</u> The proper values of temperature are thus obtained directly from the graph.

In the case of the temperature instrument, the calibration curve itself has been modified so that transmitted values may be directly applied to the graph.

By reasoning identical to that described in connection with the atmospheric pressure unit, the transmitted code group corresponds to a resistance value differing from the correct resistance by a factor equal to the indicated resistance times the mean temperature coefficient. In order to obtain correct readings from the instrument calibration curve, it was necessary to <u>subtract</u> the temperature correction values point by point on the <u>original</u> curve for temperatures above +70°F, and to <u>add</u> the corrections for those below +70°F. The curve was then replotted as shown in figure 28.

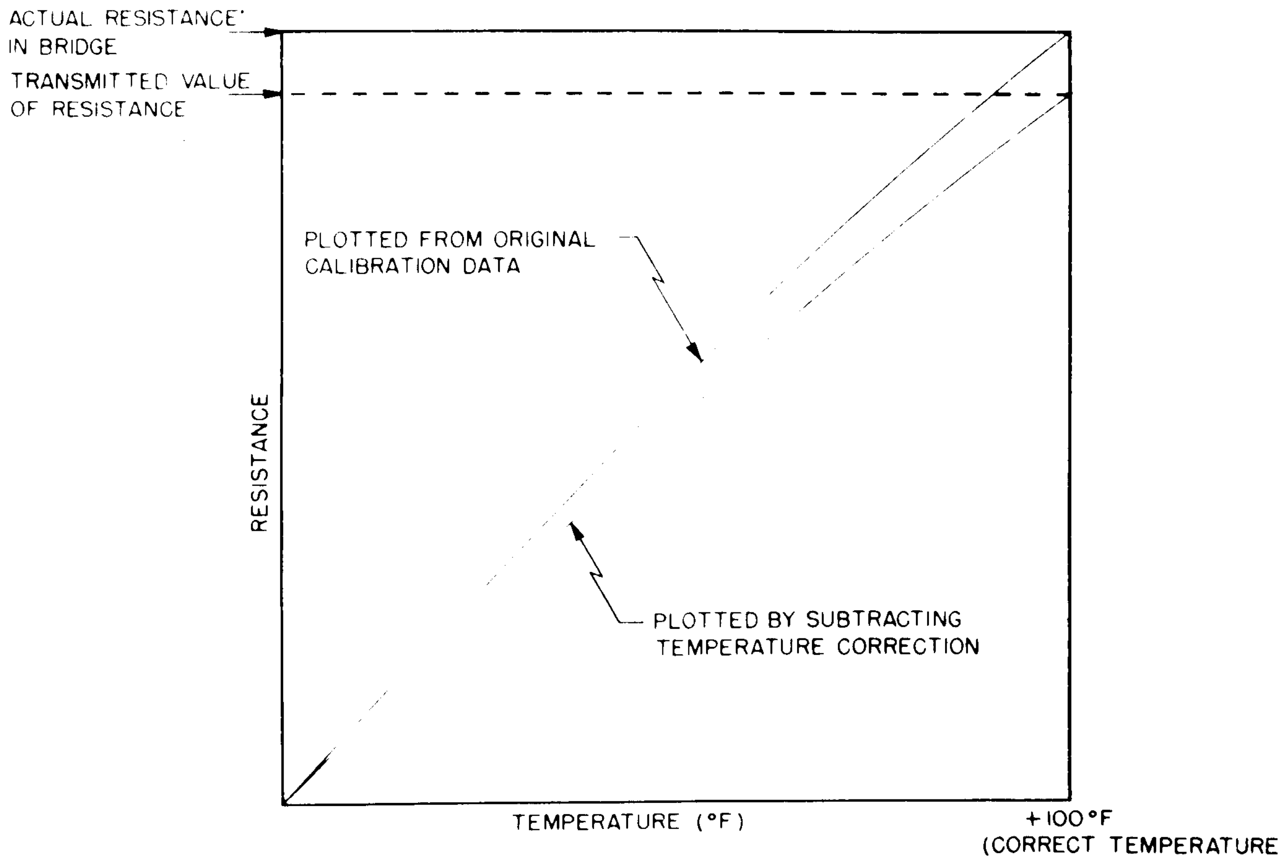


Figure 28. Instrument calibration curve.

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